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ADDRESS AT THE OPENING OF THE SESSION

on 3 November 1941, by the President

THE RIGHT HON. SIR GEORGE CLERK, G.C.M.G., C.B.

WHEN we reflect upon it, it is, I think, no small thing that here, in the third year of the war—the greatest, the most general, the fiercest, and the foulest in the world's history—we meet as usual, in our own house, for the normal annual opening of our regular Session. That we are able to do this is due to the efforts of the retiring President and his immediate helpers, the staff of the Society.

It is unnecessary for me to enumerate the many outstanding qualities with which F.M. Sir Philip Chetwode has adorned the office of President of the R.G.S., but I may be allowed to express the warm thanks and deep appreciation that the Society feels for the way in which he has served its interests, and markedly so, during these two last difficult years. For me, Sir Philip's retirement has a very direct significance. He is a difficult man to follow and he has set a very high standard for his successor. I can only assure you that I shall do my humble best to live up to it.

As regards the proceedings of the Society itself, the shadow of the provisional hovers over all that we may propose, and we have to adapt ourselves to the difficult conditions of our day-to-day existence. As you will have seen from the Fellows' tickets, our meetings, whether Afternoon or Evening, are arranged for 3 p.m., in order that people may be able to get home before the black-out, or the raider makes locomotion too disagreeable. After the turn of the year and as the days draw out it may prove possible to fix a later and more convenient hour, but for the present I am sure the Society will agree that we had better stick to 3 o'clock.

Our resolution to keep the Society at full work in London, with the Library and Map Room open, has so far been justified by our escape from any serious damage, and fortified by the great use which has been made of our books and maps, not only by our Fellows but by the Service Departments, which have continually demanded them. Subject to the attentions of enemy aircraft we therefore intend to carry on in this respect.

Our publication of the *Journal* has been maintained, though somewhat late. It has shrunk in size, partly because of the requirements of the paper controller, but also because the flow of results from expeditions has necessarily become small, and because some who have given us excellent lectures have not been able to produce the copy for publication. We are the more indebted to those who have done so, often under the burden of more urgent official or military duties. But to maintain the *Journal* monthly is a principal duty to all our Fellows, and we shall do our utmost to fulfil it. Some issues of the *Journal* posted abroad have been lost by enemy action. If those who bind their *Journals* will inform us of gaps in their sets due to this cause we will do what we can to fill them. We ought especially to make up the sets in public and university libraries.

The last Council Report naturally showed some diminution in the numbers of the Society, but we have a strong body of Fellows resolved at all cost to maintain their Society, and the encouraging number of elections during the recess is a good augury for the future.

Last year we undertook to make for the British Council a map of Europe and the Middle East, an ambitious map with editions in English and Arabic. The drawings for printing in six colours are now finished and we hope to see it reproduced without much delay. If it has the success for which we hope, it may be followed by extensions westwards and eastwards, which are already planned. If I might say this personally, I think the map as it is designed is one that will redound to the highest credit of the Society. It is a beautiful piece of work in itself and I hope it will meet with the great success it deserves.

A PRELIMINARY REPORT ON STUDIES OF THE MOUNTAINS AND GLACIERS OF ALASKA

H. BRADFORD WASHBURN, JR.

ALMOST exactly eleven years ago, among the beautiful mountains of the Fairweather Peninsula, I got my first taste of Alaska. The Fairweather expedition was a bitter introduction to Alaskan mountaineering. For more than forty days our party of six men fought its way through the rain-swept foothills and glaciers of the Coast Range, only to be turned back a scant two-fifths of the way up our goal. However, the memories of that first trip still thrill me. We walked glaciers and traversed valleys that no human being had ever visited before. We breathed the wonderful fragrance of the mossy virgin forests of the coast, and we camped in the desolate wilderness of the mountain passes.

From the standpoint of climbing achievement, my first Alaskan expedition was a bitter disappointment, but our whole party returned to the United States at the close of the summer of 1930 much the wiser for our experience and thrilled at the sights we had seen. Here were unmapped mountain peaks higher than the tallest of the Alps, and glaciers vastly longer than the famed Baltoro. The surveys of the International Boundary Commission had unearthed a wealth of information about many of the unknown peaks of the Alaska Coast Range when they carried their triangulation across its very backbone from the White River to Mount Saint Elias. But huge inaccessible unsurveyed pockets still remained more than a decade after the Boundary Commission had concluded its field work. Five thousand square miles of totally unmapped country still existed in the eastern part of the Saint Elias Range between Kluane Lake and the Alaskan boundary. Three thousand more miles of unknown peaks and glaciers stretched westward from Mount Saint Elias to the valley of the Copper River, and almost the entire northern watershed of the Chugach Mountains of Prince William Sound had never been explored either on the ground or from the air.

In 1932, 1933, and 1934, working relatively near civilization in the southern part of the Fairweather Range our Harvard-Dartmouth Expeditions explored Mount Crillon, climbed to its summit, and mapped its approaches. Camped for several months at lovely Crillon Lake, we learned more and more about the behaviour and characteristics of Alaskan glaciers, and practised the new technique of co-ordinating our ground party with aerial photography and supplies dropped from airplanes. We tested climbing equipment, survey and radio equipment on the treacherous but accessible slopes of Crillon, and in the winter of 1935 an experienced group of men from these trips formed the nucleus of the National Geographic Yukon Expedition.

Since the Yukon Expedition, which effected the first crossing of the Saint Elias Range from Canada to Alaska in the winter and spring of 1935, our Alaskan expeditions have been organized and executed with a single definite purpose. I have wanted to study on the ground or photograph from the air all the great mountain ranges and glaciers of Alaska. It would probably be

impossible for a single man to visit all the Alaskan glaciers in a lifetime unless he had absolutely unlimited resources. But with careful planning, and saving expense wherever it was possible, we have succeeded in advancing a long way toward our goal in these last five years.

The National Geographic Mount McKinley Flight Expedition of 1936 brought back the first complete series of air photographs of the region about Mount McKinley and Mount Foraker. Our Lucania Expedition of 1937 succeeded in making the first crossing of the northern Saint Elias Range, and in 1938 our ascents of Mount Saint Agnes and Mount Sanford, and the Harvard-National Geographic Society flights around the Chugach, Saint Elias, and Wrangell Ranges have practically wiped out the last vestige of totally unknown glacier country in southern and coastal Alaska.

In Glacier Bay in 1940 and in the Mount Hayes Range this summer we are now trying to fill in some of the last remaining chinks in the large pattern. Our supply of funds is still very limited, and much of our financing has had to be done by lecturing and writing in the winter time to pay for the food and transportation of the following summer. Probably all the spectacular discoveries have now been made. We have discovered several of the longest glaciers in the world outside the Polar regions. Lucania is at last climbed, and the Saint Elias Range has been crossed. Three or four truly great virgin peaks still challenge whoever wishes to work his way into the inner recesses of the coastal mountains. Mount Vancouver, Mount Hubbard, Mount King George V, and Mount Queen Mary are the greatest prizes American exploratory mountaineering has yet to offer.

Two more years of field work should result in a sufficiently complete photographic record of the great glaciers and peaks of Alaska to make possible a special publication for scientific study and reference. I write in Fairbanks, awaiting a clear day to finish our work in the interior ranges about Mount Hayes. With this preliminary report I am submitting nearly one hundred carefully selected photographs from our Alaskan files at the Harvard Institute of Geographical Exploration at Cambridge. These pictures represent a balanced cross-section of our Alaskan field work of the last four years. They may be studied as a series showing the mountains and glaciers of Alaska, or they may be considered as a group which displays almost all the well-known features of glacial geology as exemplified in the Alaskan ranges.

I know no place more wonderfully adapted to studying the work of moving ice and its many interesting phenomena. The Alaskan rainfall varies from hundreds of inches in the Coastal Ranges to only a scant 12–14 inches in the cold, dry interior. Its mountains number among them several of the highest subarctic peaks in the world, yet many of the lower slopes of these same giants are swept by warm prevailing winds and rain throughout twelve months of the year. In many valleys one can photograph a stagnant, retreating glacier one minute, only to turn to the opposite side of the cabin a few seconds later to see an active river of white ice flowing downward in a record advance.

Alaskan weather is as local and peculiar as are the varied movements of its glaciers, and I can do little more in so short a preliminary report than to say that by far the majority of the glaciers of Alaska are to-day either semi-stagnant or in full retreat. In parts of Yakutat Bay and in Glacier Bay

Miles
Heights in feet
Canada
United States
Dawson
Fairbanks
Tanana
Copper Center
Valdez
Cordova
Seward
Anchorage
Kodiak
Juneau
Whitehorse
Yukon
BRITISH COLUMBIA
Alaska Highway
Mt. McKinley 20300
Mt. Foraker 17000
Mt. Hubbard 16000
Mt. Blackburn 16000
Mt. Sanford 16000
Mt. Wrangell 14000
Mt. Bona 17000
Mt. Elias 18000
Mt. Logan 19500
Mt. Kennedy 13300
Mt. Natazhat 16000
Mt. McCarthy 14000
Mt. Steele 16000
Mt. Vancouver 15700
Mt. Fairweather 15300
Mt. Crillon 12726
Mt. Kaiser 12300
Mt. Illiamna 10300
Kluane Lake
Nabesna
Chitina
McCarthy
Cook Inlet
Gulf of Alaska
Alaska Range
Wrangell Mts.
St. Elias Mts.
Chugach Mts.
Aleutian Range

recessions of as much as 9 miles with a removal of no less than 3000 feet of solid ice during the last thirty years have been authentically recorded. All through the Saint Elias Range on our Yukon Expedition we came across reliable evidence of a drop of between 1000 and 2000 feet in the surface of the largest glaciers, even though their dwindling snouts still occupy almost exactly the same position they did a quarter of a century ago. The cause of this vast change is impossible accurately to determine, but it is doubtless either the result of a sweeping change in the flow of the warm Japanese current or an alteration of similar magnitude of the direction and moisture content of the prevailing winds from the Gulf of Alaska. The few local advances that have been recorded in recent years in different parts of Alaska have almost all been explainable as a direct result of the effect of continued earthquakes or some local freak climatic condition. All these abnormal local advances have been followed by an extremely rapid period of stagnation and retreat.

The pictures which have been presented by the writer to be preserved in the files of the Royal Geographical Society are the real scientific contribution of the work of these various expeditions. The expense and work involved in taking these pictures has made it impossible yet to undertake any mapping of the areas which they cover. Many of them have been taken solely for the purpose of illustrating fundamental principles of glacial geology and do not constitute a part of a system of carefully exposed survey photographs. Many also are now in the offices of the Alaskan Branch of the United States Geological Survey in Washington, where they are being used to speed the completion of the new military maps of Alaska.

Without the generous and constant assistance of Dr. Hamilton Rice of Harvard University and The National Geographic Society of Washington, this field work could not possibly have been accomplished. For nine years Dr. Rice has supplied the instruments and cameras for our work in Alaska, and in 1938 he made a substantial contribution toward the expense of our photographic flying and transportation. In 1935, 1936, and 1938 the National Geographic Society made generous grants from their research funds for our work in the Saint Elias Range and over Mount McKinley. The illustrations published with this article are printed with the special permission of the Harvard University Institute of Geographical Exploration and the National Geographic Society.

Our flights were made from a great many small fields in different parts of Alaska and north-western Canada. In two instances we succeeded in taking off our ski-equipped plane in mid-summer from the sloppy Valdez mud flats at low tide. Some of the coastal flights were made with pontoon-equipped seaplanes, but by far the majority of the air photography was done from regular single-motored land planes with wheels. It is almost needless to say that the utmost care was taken in order to keep the motors in perfect shape for these repeatedly long flights over unlandable and totally inaccessible country.

Valdez and Cordova were the main bases where most of our supplies were kept, although we also worked out of Anchorage, Fairbanks, Juneau, Kluane Lake, McCarthy, and several smaller fields. In Valdez we hired an old abandoned house as headquarters. We built a large drying frame out of scrap wood for handling our 75-foot rolls of film 9½ inches wide. By midnight

after each flight all our films were developed, washed, and ready to inspect in a chilly shed behind our ancient hangar. The Eastman and Agfa Companies co-operated with this work by giving us a number of samples of special new emulsions with which they were experimenting, and some of our best pictures turned out to be those taken on rolls of ultra-high-speed test film. Having a field laboratory proved a tremendous boon to this work, as it made possible a constant check on our progress, and also three or four times field development revealed camera troubles which would unquestionably have ruined almost all our pictures if it had not been spotted and repaired immediately.

The camera equipment that we used on all of the flights was the best available in the United States, and was supplied by Dr. Rice of the Institute of Geographical Exploration. Roughly two thousand five hundred 7×9-in. oblique pictures were taken with our Fairchild K.6 camera with a Schneider Xenar 12-in. f/4·5 lens, and some 200 verticals were made with a Fairchild K.3B mapping camera with a Ross Xpres 8·25-inch f/4.0 lens. The K.6 was equipped with a focal-plane shutter. The K.3B had a between-the-lens shutter, as the focal-plane is not at all well adapted to precise vertical work.

The vertical mapping camera was mounted in the back of our cabin monoplane over a large hole cut in the floor, and only used for occasional pairs of stereoscopic photographs of extremely interesting details of topography or glaciology. To do a vertical survey or mosaic of the Saint Elias Range would not only take several hundred thousand photographs, but the great height of the peaks would necessitate a plane that could operate in the stratosphere. For effective stereoscopic vertical work we followed the rule that ground relief should never exceed 30% (preferably 20%) of the airplane's net altitude above the ground. Net altitude refers to the actual altitude of the plane above the ground, in contrast to altimeter height above sea-level. A great many important details are apt to be lost in a study of plain vertical pictures taken without 60% stereoscopic overlap. Even the most careful handling of lights and shadows sometimes fails to reveal small topographic features as convincingly as a stereoscopic pair taken with virtually no shadows at all.

So far as possible our oblique photographs were taken to criss-cross systematically the last remaining great unmapped areas of the Coast Range. But weather conditions almost invariably impaired the efficiency of this work, as in five months spent in Alaska from mid-May till mid-October, 1938, we had only three completely cloudless days. To do good work in such abominable weather conditions, we were forced to make four flights around different parts of the Saint Elias Range, in order to photograph what otherwise could have been done in a single long flight on a really clear day. Our whole project was broken down into a series of minor sub-projects at the beginning of the season, and we rarely knew until just before we took off exactly what job the weather was going to let us tackle. One day a light-leak in one of our magazines necessitated our re-flying some pictures which we had just taken of an area near Cape Saint Elias particularly famed for its bad weather. We waited for over two months before we were finally forced to go home at the end of the summer without a single chance of taking them over again.

It would be hard to describe in detail the airplanes that we used on the many different flights made in taking these pictures. Despite the constant support of both Dr. Rice and the National Geographic Society, the capital involved in making flights in the remote parts of Alaska and western Canada was an ever-present obstacle that could not be disregarded. Many of the trips over the highest parts of the Saint Elias Range required work at nearly 20,000 feet; at such a height a 450-horse-power Wasp motor burns over 30 gallons of gasoline an hour, and the gasoline at our cache at Kluane Lake in Canada was valued at $1.25 per gallon.

If we had had unlimited resources, we should have chartered a single plane and pilot and retained them until the whole job was properly done, but to conserve our finances we did this only at Valdez, and chartered different airplanes at several other points to do the flights over single isolated areas. Alaskan weather is so fickle that the only practical way to photograph there is to base as near as possible to the spot to be photographed, and then wait until the weather clears long enough to do the job in a short, carefully planned hop. Valdez proved a good strategic base for the western part of the Saint Elias Range and the Chugach Mountains around the head of Prince William Sound, but our pictures of Mount McKinley were taken from Fairbanks and Anchorage on four different flights, the pictures of Mounts Iliamna and Redoubt were made on a single flight from Anchorage, and our work over Mount Crillon, Mount Fairweather, and Glacier Bay had to be done from Juneau.

Most of our pictures were taken from a Fairchild 71 cabin monoplane or a Bellanca Skyrocket of similar design. Both planes were powered with single 450-horse-power Pratt and Whitney Wasp motors, and all our pictures were taken out of the door opening rather than a window. In order to make the cabin as comfortable as possible while we were flying to or from our assignment, we built a special door, the whole centre of which would remove from the inside while we were in flight, leaving an opening 18×30 inches out of which pictures could be taken. On the flights over and around Mount McKinley, and all the flights out of Anchorage, our door would not fit the planes available, and we simply removed the door completely before taking off and dressed as warmly as possible.

On several of the flights I was able to take a recorder as well as a pilot. On these trips it was easier to keep complete, detailed records of every picture at the moment it was taken. Dr. G. Dallas Hanna of the California Academy of Sciences at San Francisco did a good job for me as recorder on several of our longest flights in 1938. In most cases however I did my own recording, writing in pencil on a series of Flight Report Sheets clipped to a stiff board lying on the floor by my right side where I sat working at the door. On my right were two extra 110-exposure magazines, an accurate aneroid barometer, a large clock, extra sharp pencils, extra filters, and a pair of heavy mittens to wear whenever I got a chance to take off my light fur gloves. It was never excessively cold, averaging about 5–10° below zero Fahrenheit at 16,000 feet in clear weather. But the chilling effect of the big peaks on the air around them was very apparent. Around Mount Logan and Mount McKinley the temperature would often drop as much as 10° in a single mile as we circled

closer to its peak (without gaining altitude) in order to take a close-up of its summit.

On the flights over Mount McKinley we used oxygen at altitudes over 16,000 feet, but it proved so expensive and difficult to transport in quantity that after our 1936 expedition we have been forced to work as best we could without any artificial aid to breathing, even as high as 22,000 feet. It would be foolish to outline in these pages the many problems of photographic work at high altitudes without oxygen; every day the newspapers are full of accounts of the lack of ambition, lack of memory, and general dullness of all the bodily functions that are encountered in prolonged flights above altitudes even as low as 12,000 feet. Fully aware of these pitfalls, and unable to afford the expensive methods of relief from them, we did the best that we could, using patience, care, and persistence to take their place.

Nothing in the world will take the place of oxygen, but the best substitute for it is dogged persistence. All that I could muster, coupled with the consistently careful and courageous flying of nearly a dozen veteran Alaskan pilots, have yielded the pictures which are the treasured record of these years of work in the north. The photographic details of film and exposure have been attached to every photograph of the series. I submit these and this brief paper to the Royal Geographical Society as a preliminary report on a most thrilling and interesting undertaking; one which I hope some day soon will result in a complete record of the greatest glacier system on earth beyond the limits of the polar ice caps.

NOTES ON THE ILLUSTRATIONS

The very fine series of photographs, 9 × 7 inches, presented to the Society by Mr. Bradford Washburn, includes 7 aspects of Mount Logan, 6 of Mount McKinley, 5 of Mount Sanford, 4 of Mount St. Elias, Mount Iliamna, and Mount Hunter, 2 of Mount Crillon, Mount Natazhat, Mount Lucania, and Mount Redoubt, and 1 of Mount Wrangell, Mount Butha, Mount St. Agnes, Mount Blackburn, and Mount Bona, and a great number of obliques and verticals of glacier detail, moraines, and eskers. The whole series will be of great value to students of geomorphology and glaciology, and our Society is much indebted to the donor for this important gift.

From these photographs we have selected twelve for reproduction. In the detailed description of these which follows, technical data are given for each photograph in the following order: date; time; film; exposure (225 meaning 1/225 s); stop (f 16 meaning f/16); filter; height in feet; and serial number by which copies of photographs can be ordered. The following abbreviations are used for the type of film: ESSP, Eastman Supersensitive Panchromatic Aero Film; ASSS, Agfa Triple-S Panchromatic Aero Film; EP, Eastman Panatomic; EHCPA, Eastman High Contrast Super Double-X Pan Aero Film.

1. *Mount McKinley from the north-east*

18.9.38 11.40 ASSS 225 f16 Red 10,000 2401

The photograph of Mount McKinley, 20,300 feet, the highest mountain in Canada and Alaska, was taken from the north-east, 70 miles away across the McKinley Park. The ascent of this mountain has been accomplished only twice, in 1913 and 1932, both times *via* the Muldrow glacier and the central ridge on the north-east side. The early attempts to climb the mountain were

made from the south-east up the Ruth glacier, but the cliffs at the head of the glacier are 10,000 feet in height and practically vertical. From the south, at the head of the Kahiltna glacier there are 12,000-foot granite cliffs which are almost unscalable.

2. *West face of Mount St. Elias*

20.8.38 10.02 ESSP 150 f4.5 Red 14,400 1982

Mount St. Elias, 18,000 feet, is the third highest mountain in Alaska and Canada. The photograph of the west face shows, to the left (N) of the summit the ridge climbed by the Duke of the Abruzzi and his party on 31 July 1897. Their last camp was on Russell Col (14,000 feet), the snow pass in the centre background, from which they made the 6000-foot climb to the summit and back in a single day. The Newton glacier which they ascended seems to be much rougher than when they traversed it. From the sea the S.S.E. face of the mountain can be seen, with its perpendicular wall which drops 15,000 feet from the summit to the surface of the Libbey glacier.

3. *North face of Mount Redoubt*

4.8.37 16.50 ESSP 150 f4.5 Red 9500 426

Mount Redoubt, 10,200 feet, is an extinct volcano near Mount Iliamna on the Alaskan Peninsula. The summer snow-line on these peaks is very low because of the constant stormy weather and heavy winter snowfall.

4. *Mount Crillon from the north-west*

18.8.40 19.00 EHCPA 225 f5.6 Red 10,000 2735

The picture shows the 7000-foot precipice of ice-encrusted rock on the north-west face of Mount Crillon (12,728 feet). The Pacific Ocean, beneath the low clouds, is only 20 miles away to the right. Mount Crillon was climbed by the Harvard-Dartmouth Expedition in 1934. There is a description of the summit and detailed work on this mountain in the *Journal* for June 1936.

5. *Barnard glacier and Mount Natazhat*

6.8.38 16.00 ASSS 225 f16 Red 13,000 1355

The medial moraines of this glacier are probably among the most amazing in the world. The glacier flows into the Chitina valley some 60–80 miles east of McCarthy. Mount Natazhat, 13,440 feet, is one of the isolated peaks on the international boundary, which were climbed during the boundary survey. The summit is in Canada, the boundary passing just to its west.

6. *Moraines of the North Iliamna glacier*

4.8.37 17.05 ESSP 75 f4.5 Red 9500 434

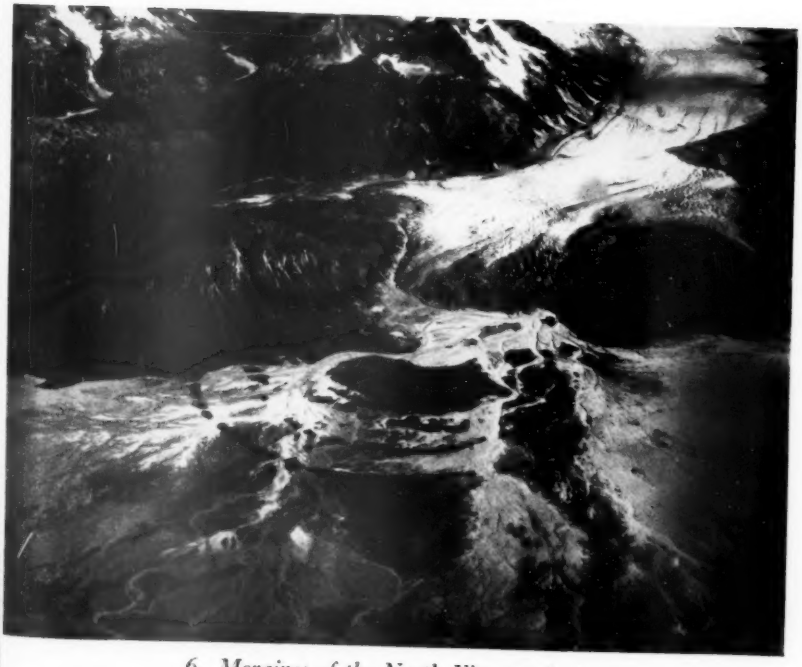
The photograph shows an extraordinarily perfect series of recessional moraines which have not yet been obliterated by the work of glacial streams. Mount Iliamna, 10,200 feet, is an unclimbed active volcano on the west shore of Cook Inlet, south-west of Anchorage.

7. *Miles glacier and Miles lake*

23.8.38 16.45 ESSP 225 f4.5 Aero 2 900 2077

Miles lake is formed by a large bend of the Copper river east of Cordova. The photograph shows the unique crevasse pattern developed where the glacier emerges from a narrow valley and expands laterally in the broad Copper river valley as it empties into Miles lake.

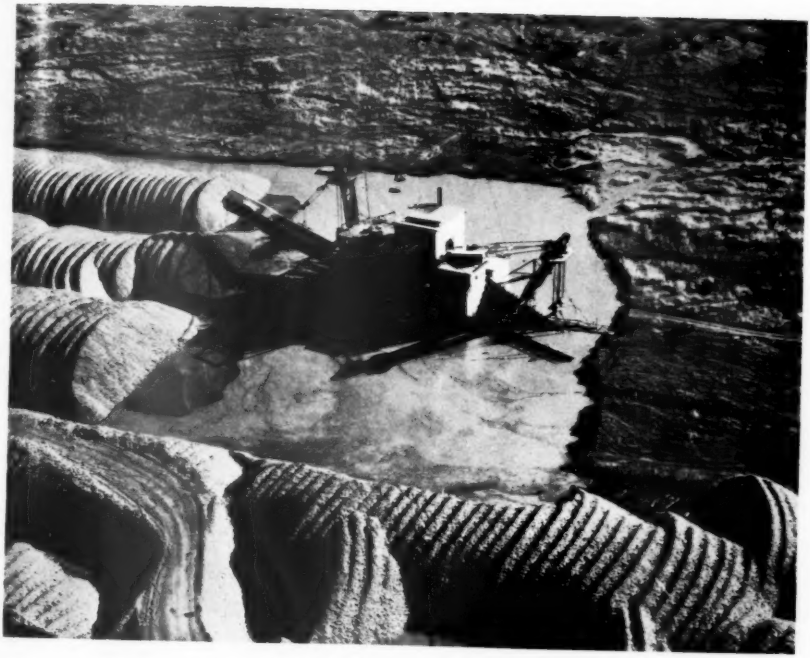
5. Barnard glacier and Mount Natazhat



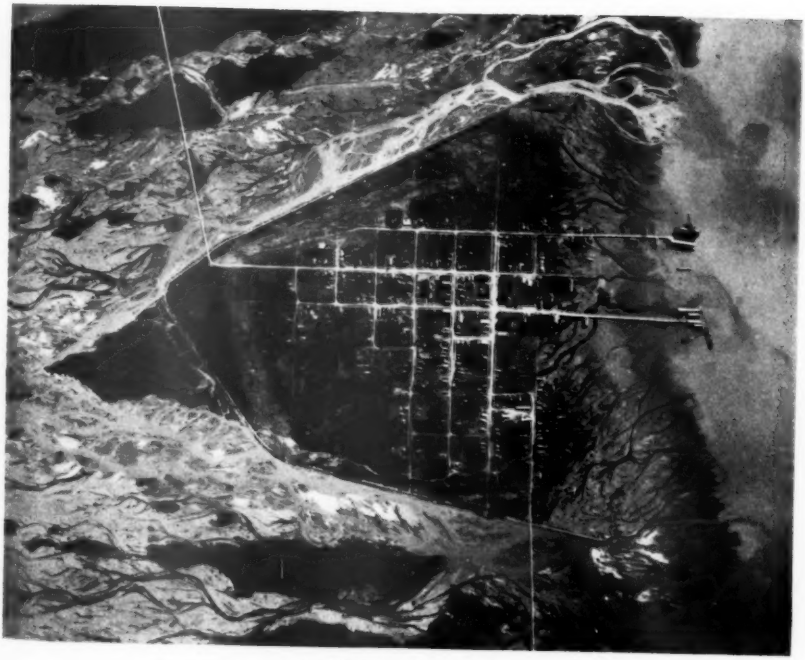
6. Moraines of the North Iliamna glacier

7. Miles glacier and Miles lake

8. Woodworth glacier and esker



9. *Gold dredge at Fox*



10. *Valdez (vertical)*

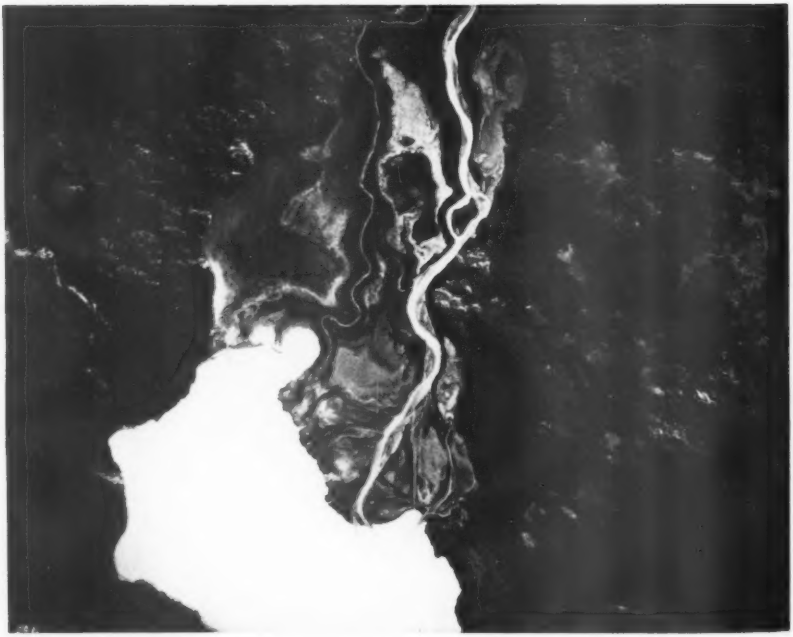
3. North face of Mount Redoubt

4. Mount Crillon from the north-west

1. Mount McKinley from the north-east

2. West face of Mount St. Elias

11. Spring near Copper Center (vertical)



12. South end of Tonsina lake (vertical)

8. *Woodworth glacier and esker*

12.8.38 18.45 EHCPA 225 f4.5 Aero 2 4800 1839

The picture actually shows a recently formed esker. The pattern of the esker ridge and the delta at its end where the ice-front used to be are proof of its origin as the floor of a sub-glacial stream. In the background there is the snout of the Woodworth glacier; in the foreground there is a creek leading to the Tasnuna river. The longitudinal lines on the right are not scratched in bed rock, they are ridges of coarse gravel on a frozen surface; their origin has not been definitely determined.

9. *Gold dredge at Fox*

–.9.38 09.00 ASSS 225 f11 Red 500 2425

The photograph shows the gold dredge at Fox near Fairbanks with the dredge tailings in the foreground.

10. *Valdez* (vertical)

5.8.38 12.45 ASSS 150 f16 Minus Blue 7000 1170

Valdez, linked to Fairbanks by the Richardson Highway, was used as the expedition flight base. The town was built on a huge glacial outwash plain of coarse gravel; a dike protects it from occasional high water and floods in the spring. The airport can be seen in the angle formed by two of the sides of the town. Scale approximately 800 feet to an inch.

11. *Spring near Copper Center* (vertical)

14.8.37 14.00 EP 50 f4.0 Aero 2 10,000 276

This spring, which lies on the gently sloping ground between Mount Sanford and Copper Center, is probably some sort of chemical spring, the water from which kills the vegetation about it. Note the interesting peripheral drainage. Although the spring may look rather like a cove, it is definitely not, and cannot be seen at all from a distance of several miles even from the air. The scale is approximately 850 feet to an inch.

12. *South end of Tonsina lake* (vertical)

14.8.37 14.30 EP 50 f4 Aero 2 9500 306

The photograph illustrates the way in which a glacial stream (the Tonsina river) fills a lake with glacial silt. The scale of the photograph is approximately 800 feet to an inch, so the large size of the delta can be appreciated.

HALF A CENTURY OF POPULATION TRENDS IN INDIA: A REGIONAL STUDY OF NET CHANGE AND VARIABILITY, 1881–1931

ARTHUR GEDDES

IN this paper will be shown two aspects of change in the population of India, region by region, during the last fifty years. The text interprets the folding "cartogram," or map utilizing administrative units, on which the statistics have been plotted. So far as possible, the administrative district as constituted in 1931 is taken as the territorial unit. On this folding-map whole numbers give the net percentage change (of increase or decrease) from 1881 to 1931, and numbers to one decimal place the variability per cent. in these changes. The two smaller maps in half-tone are based upon the larger, and show by layer colouring the generalized results. The second half-tone map therefore indicates whether the net change has occurred at a steady rate or whether, on the contrary, it has been reached by decades of alternating or varying increase, decrease, or arrest. For the manner of change is an essential clue to the relative regional conditions, whether of fair subsistence and of health, or of famine or "deficiency" and of disease.

The idea of determining deviations from any steady rate of regional change, the variability, as I have called it, has been indicated, with examples drawn, for contrast, from western and north-eastern India, in my paper on the population of Bengal (Geddes, 1937). This concept or method may, I hope, be of service to the authorities in reporting upon the census of India in 1941; for I am not aware that it has hitherto been given this statistical expression with regard to India nor indeed to any other country. Although these statistics were worked out for India by 1935, I preferred to withhold their publication until I should have re-visited the country and travelled as widely as possible, bearing in mind these statistical facts and the questions of interpretation they suggested. By help of a grant from the Carnegie Universities Trust, which I wish to acknowledge here, further field study was duly made in India in 1938–39, by land, water, and air. This furnished an admirable opportunity for observations and also brought me personal contacts in all parts of India which continue to be of the greatest possible assistance.

After every census the reports confirm that in India the normal human urge to mate and breed, to marry and to found and enlarge a family, reinforced for all the creeds by their sacred texts, is hardly checked by poverty, short of famine, unless (to a limited extent) by delay in marriage. As a result, whenever natural resources cannot be, or are not developed and increased then, under the existing social and economic system, population always tends to increase beyond the margin of safety. Sooner or later danger materializes, and for a time the death-rate gains on the birth-rate or surpasses it. The birth-rate itself naturally varies somewhat, but to nothing like the degree to which the death-rate differs in different times and tracts. In other words, and making allowances for the association of disease with poverty, in India under existing conditions the Malthusian diagnosis is still broadly correct.

The results will here be traced for the last fifty years first by noting and plotting the percentage increase from 1881 to 1931 and commenting, so far as possible, upon the difference between "natural" changes and changes affected by migration. Yet it is not enough to distinguish population conditions merely by the net percentage change, dividing the highest rate of increase—which indicates that the population has enjoyed relative "prosperity," hitherto or at least till recently—from the various grades below.

Among regions which after fifty years have increased but little, or not at all, we must find a quantitative criterion which shall distinguish two dominant opposing types: those where the larger part of the population suffer from chronic deficiency of necessities, and usually, from severe endemic diseases, particularly malaria (with which almost the entire population may become infected); and those where decades of sufficiency and good health alternate with crises of scarcity and famine and the accompanying epidemics which, in months or even weeks, will mark the death-rate of a decade with disaster.

It would be hard to say which of these two unhappy regional types of Indian population calls for deeper concern, the chronically stagnant or the fluctuating; but of the two I am inclined to think the first. What is certain is that diagnosis is needed. Only one side of the problem of population and subsistence is indicated by a map of famine tracts, where increase alternates catastrophically with sudden decline. To complement it we require another map showing regions where a low net rate of population change is almost unvaryingly maintained, whether this be of low increase or decrease, or be simply virtual stagnation of numbers. For from the latter we may usually infer severe, constant deficiency or endemic disease, or else both in association. A map of chronic stagnation is not less but perhaps even more important than a map of famine as regards the numbers it represents. For it concerns regions with a total population of nearly one hundred millions of present survivors, regions which, if relatively small in area, are still among the most densely peopled in India.

The essential instability of population in India through the last half-century is found in all regions but the most favoured, where growth has been rapid and steady. This instability is most obvious in famine tracts, where marked increase alternates with marked decrease, and leads to something like net arrest after half a century. Such fluctuation about a mean, however violent, however high its rate of variability (as I shall call it) is sometimes described as stability, a misuse of words to which I cannot bring myself. It might seem however that when the census shows the same figure decade after decade the word stability might apply. Yet even here closer analysis would show that this condition, typical of areas which suffer from endemic malaria (like the western half of rural Bengal), is really no more than a precarious annual see-saw between the birth-rate and the death-rate, for the death-rate soars at the malaria season. This pulsation, month by month, will be smoothed out even by yearly and still more by decennial records; but here too the condition is still the reverse of true stability. Eschewing this term, I propose to describe net arrest after half a century of severe fluctuation simply as *net arrest* with great, notable, or extreme variability, and to describe net arrest accompanied by the feeble but equal pulsation, seasonal and other, which

gives only the slightest decennial variability, as *stagnation*. These terms may not be final but I trust they will be clear.

One further point must be referred to here. This is the part of migration in bringing about change in population of which general regional indications will be given. It is customary in Indian reports to distinguish from the net change in population per area the change in the natural population, that reached by excluding the number of migrants. I had wished to treat this statistically also, but unfortunately the task of doing this for the whole period is too heavy for a single worker to undertake in proportion to the value of the result. In most areas of India even the net internal migration is rarely important, while new laws and popular protest increasingly restrict emigration to Burma, Africa, and elsewhere. In the Census of India, figures for internal migration are derived from the place of birth. I may add that the total of Indians abroad was estimated at barely two and a half millions in 1931. During the previous decade, notably in 1930, the return of Indians to their homeland exceeded the exodus.

In a cartogram a large area of low average density of population assumes an undue importance to the eye, quite out of proportion to the actual numbers it contains and with which we are concerned. Hence density must be kept in mind, as a corrective. For this reason in the first place I have generally stated, in the text, the average density per square mile attained, in 1931, in any district discussed. Such district densities differ widely, from Sind, where a district may chiefly consist of steppe desert, or from the Chota Nagpur plateau with its forest solitudes, to the teeming plains of north-eastern India. Densities calculated from the cropped area (averaged for a given period) naturally differ far less from one another in any of these regions. These give a truer idea of the area needed to support an agricultural population. They rarely drop below 200 and as a rule exceed 400 or 500. For three or four acres of riverside oasis in Sind, of maize patch and paddy plot in a jungle clearing in the north-eastern plateau, or of paddy fields in the plains, alike demand a comparable amount of labour, and each may supply a comparable return of something like a year's meals for a family. Yet a district's average density is useful both because it indicates the type of country and conditions and the relative accessibility or isolation of its settlements, and also because it reminds one that though a district may be small the number of its inhabitants may be large. These figures can be seen from the Subsidiary Tables appended to Chapter I of each Census Report, together with summary percentages for areas of crops, the differing values of which are generally indicated in the Report. I have discussed the question of density per cultivated area in comparing the Chota Nagpur plateau with the bordering plains in Bihar and Bengal and in describing the Delta of Orissa, its agriculture and population (Geddes, 1938).

In considering changes in relation to the density of population attained, one must think of the environmental basis both of present distribution and of historic movements. The areas of lowest population occur at opposite extremes of relief and water supply: where rainfall is lacking or almost absent on an alluvial plain unirrigated by canals; and in hilly country of high rainfall, in which steepness of slope or lack of good soil, abundance of forest vegetation

and the presence of malaria, together with isolation from the greater areas of Hindu population, have combined to retard colonization (Sion, 1926). Outside the canal colonies on the plains of the dry north-west and the hill and intermontane jungles of the wet north-east, the highest rate of increase (combined there with the greatest density) is found in alluvial plains abundantly watered both by heavy and long-continued rains and by silt-depositing floods. These are the conditions found in populous eastern Bengal and along the teeming coasts of Travancore and Cochin.

While famine, economic crisis, or epidemic lowers the survival rate almost immediately, their effects in any region are also felt long after. To attempt to trace this partial lag of effects behind the causal factors would take us too far; and I can only allude to the more immediate effects of famine or disaster when discussing fluctuations of population. It should be noted that crises of mortality, whether due to famine from crop failures, to epidemics, or to both, have this in common. By adding to their immediate effects other effects which will be felt later, they tend to promote instability and to favour the periodic or cyclic recurrence of crisis. The relation of these facts and tendencies to the high variability of certain tracts will be discussed later.

Extreme ill health is of course generally associated with the extreme poverty of many or most of a district's population. The extent to which the specific diseases of India are due to the deficiency of necessities, primarily of good food but also of winter clothing and proper housing, is hard to measure, particularly for a disease such as malaria. Investigators of public health during the last twenty-five years have increasingly emphasized the liability to disease of the under-nourished, ill-clad, and ill-housed. The extent to which those infected may pass on a given disease even to those adequately provided for, and so less likely in the first place to develop the disease, varies with the nature of the disease and its transmission and the general conditions of environment, settlement, and life. For a survey of the conditions of one disease, so widespread either in endemic, in epidemic, or in periodic fulminant form, geographers are indebted to Hehir's 'Malaria in India' (Hehir, 1929) and, similarly, for close correlation of regional factors in cholera to Rogers (1928). Reference may also be made to Rogers and Megaw (1939).

With regard to interpretations of cause and effect, little can be said in this paper of other than directly environmental factors. These are fundamental, they are of overwhelming importance in India's relatively simple economy, and they form the geographer's special concern. Factors which are strictly social, economic, and political must of necessity be left aside. I have just suggested, as a starting point, the interplay of environment with social crystallization in forming the distribution of population before the railway age (which in 1881 had but lately opened), so explaining the major masses of population even to-day. Socially, the alien environmental and economic background of Islam, as contrasted with Hinduism in its multiple forms, should not be forgotten if we would understand the distribution of Muslims and Hindus in India, their relative social or economic status in the different regions, and their increase and decrease. Yet even here we must point out that the greater proportional increase of Muslims is primarily due to the fact that they happen to predominate in plains of high or expanding water supply,

notably in the Punjab with its extending irrigation and in the floodlands of eastern Bengal. As in this instance, social factors of differentiation tend to be secondary in India though it is true that they supplement the factors of environment. Thus even in the Western Division of Bengal the Muslim minority of 14% showed an appreciably greater increase than Hindus since 1881. We must be content with noting that (apart from natural resources and resultant income) important causes which account for a smaller increase of Hindus than of Muslims are restrictions as to diet, and also premature marriage and the prevailing prohibition of the re-marriage of widows.

Again we must be content to assume that in a given region there is more likely to be continued increase of population, and even a heightened standard of life above a survival minimum, with the introduction of new advantages. These may be given by improved crops or the extension of irrigation or again by a great rise in the price of staple market crops (such as jute, cotton, or sugar), or of other products, relatively to the price of staple food crops. The social economist or political critic would point out with truth that the region may produce more, either in quantity or value, without the general income, well-being or prosperity of the population rising in proportion. Again the differences in the efficiency and justice of administration and control of the exchequer from state to state may be considerable. But with maldistribution of wealth as such, whether in India proper or in the Empire, this paper cannot concern itself. Another fact requiring mention is the appreciable rise in the "standard of living" or of expenditure, during the period in most parts. The mobility of labour also increased, and migration, temporary or permanent, became easier, in India at least, if not latterly beyond it, with somewhat varying regional effects. For the most part however such social and economic differences do not appear to have produced very great regional differences in the rates of natural change in population; but where such causes have operated strongly, they will be touched upon so far as possible. As to the future, little more than passing reference can be made to resources still awaiting further development such as may permit of further increase of well-being or of numbers.

1. *Net changes of population for the fifty-year period, 1881–1931, by districts and regions*

In taking the period from 1881 we start from the first census which was fairly reliable and complete, that of 1871–72 having been both incomplete and of doubtful accuracy. Moreover the period taken may be regarded as likely to give as fair a mean as we can expect of the rate of actual year to year change for a rather longer period and may even offer reasonable grounds for tentative forecasts. Retrospectively, the census of 1931 showed a marked increase since 1921 of 10·6% for India as a whole, in contrast with the almost negligible increase of 1·3% from 1911 to 1921 recorded by the previous census taken after two years of appalling mortality (1918–19). Besides the thirteen million deaths attributed (as a minimum) to the pandemic of influenza which raged everywhere but in the maritime plains, further excess mortality was due to other diseases, associated with the general poverty resulting from the post-war depression (Census, vol. I, 1921). The census of 1911 showed

a recovery from the famine of 1899–1900 which took such a terrible toll from starvation, as well as an indirect toll from disease. Before this the census of 1891 closed a decade of relative prosperity, though the true percentage increase may have been over-emphasized by the more efficient and complete enumeration for 1891. Earlier still there had been much suffering in various parts of India from 1871–81. Could we have taken the half-century from 1871 to 1921, the impression would have been still blacker than that given by closing in 1931. At the same time adequate action to prevent widespread death by starvation from famine has formed a recognized principle of Government policy ever since the heavy losses in 1899–1900; and this fact alone would justify us in taking this period from 1881 as the fairer basis for forecast.

In all India only two tracts have reached a natural increase of 100%, that is have doubled their population without the help of immigration. Already densely peopled in 1881 they had surpassed by 1931 a density of 1000 per square mile. These two tracts are the south-eastern Delta of Bengal, and the south-western coastal lowland of Travancore. How far most of the Indian peoples fall short of this standard may be seen by the arrest and even decrease to be found in so many regions, or by the relatively slow average increase for India as a whole which was 39·0% from 1881 to 1931. As an indication that this rate of average increase, though higher than that of either Europe or India before 1750 or 1800, is low compared to the standards of the Occident since the industrial revolution, we may quote the increase, during the same period, of England and Wales. This was 54%, in spite of a number of special factors such as the part played by the English in the peopling of the new lands of the United States and the Colonies, the losses of the last war, and latterly the growing refusal to rear large families.

Bearing in mind this range of percentage change, I shall describe changes over 101% as *extreme*, these being almost always aided by immigration; changes of 85–101, almost the highest unaided or natural increase, as *very high* and 70–85 as *rather high*; 50–70 as *considerable*; 30–50 as *moderate*, subdividing this with 30–40 as *very* and 40–50 as *rather moderate*; 20–30 as *rather low* and 10–20 as *very low*. 0 to 10% with 0 to *minus* 10% will be described as *little changed* or (if almost 0) as *net arrest* or as *stagnation* according to the variability (to be given later), noting however if diminution is decidedly above or below 0 and nearer + or −10. Finally a decline of −10 to −20% will be described as *marked*, and −20% and over as *very marked decrease*. In this evaluation I have not emphasized either the zero line which distinguishes increase from decrease, nor yet the mean increase for all India (39% or moderate). This is because I feel that until such times as births are more or less deliberately controlled, an essential vital standard, a true biological norm must remain a high natural increase. In parts of India during the period this increase has approached, or even surpassed 100% in half a century. The grades below this, even if rather high or considerable (over 50%), are found to show one of two alternatives. Either the natural increase in a region has been checked, mainly by a heightened death-rate, and undoubtedly by a lowered survival rate, or else some of its people have been driven to emigrate: almost always an index in India of extreme poverty or of actual famine.

At the risk of controversy it should be remarked that one or other of two inferences are still frequently made from Indian population changes, neither of which quite fits the facts. The first is that if the population of a given tract has changed but little for half a century, then its condition is assumed to be satisfactory, while the continued high increase of another tract is regarded with anxiety as tending to over-population. According to this view stagnation, being regarded as a condition of stability, is less alarming than the prospect of future over-population which, it is assumed, will be brought about by increase, even though this stagnation may really be the nemesis of over-population, present and past, relatively to resources, technique, and public health.

The other inference consists in claiming that a continuing increase is almost necessarily a proof of continuing prosperity. The truth would seem to be that a high rate of increase for half a century has indeed meant, at least for the earlier decades of the period, relative prosperity, that is a relatively satisfactory condition of the environment and its utilization, of well-being and health. At the same time the population may already have reached, if not exceeded the margin of safety, beyond which they may be exposed to natural or economic crisis. On the whole in India, during this period, a continuously high increase is far likelier to be a hopeful sign than net arrest. If by high increase the people of a region have not yet lowered their standard of living (never high for the mass of people in any Indian region) and have not yet approached too closely to over-population, then there is still hope that they will, or can be helped to, make the best of their resources, present or possible, whether with further increase or with control of their numbers in relation to livelihood. Indeed the standard of living would appear to have actually risen in the two tracts of highest Indian increase which have just been cited. Certain Census Reports contain interesting analyses of these questions (Census, 1931).

Bengal and Assam.—In describing the tracts just named, let me begin with Bengal, considering next the other plains of India, and lastly the plateau. The province covers the plain of Bengal, largely enclosed by hills and sea though opening on the upper plains of the Ganges and the Brahmaputra towards the north ; and it forms a triangle, its base at the sea, its apex in the Himalayas. Owing to a rainfall of some 75 inches, to slow geological subsidence, and to the confluence of the great rivers, widely spreading floods annually enrich the eastern half of the triangle, which shows a natural increase of nearly 100%, and a density of nearly 1000. The western half, having a much poorer water supply, shows relative stagnation. As a result its density has remained in the neighbourhood of 550 per square mile, roughly the figure of 1881 but actually below the density of a generation before, owing to the terrible epidemics of malaria from 1850 to 1873, which not only caused havoc at the time but left the whole tract in the grip of endemic fever. The dense urban fringe of Hooghlyside, the continuously built-up town cluster or urban agglomeration of 2,100,000, stretching from Greater Calcutta for 30 miles upstream, has shown a very high increase of almost exactly 100% since 1872 of which fully 90% accrued since 1881 ; this is due in part to immigration from outside the

province. Except for the east, the only remarkable rural increases in Bengal have taken place either in the extreme south, by colonization in the tidal forests of the Sundarbans, or at points in the north owing to clearance for tea-gardens and for paddy. By way of comparison, it is the similar physical conditions in south-western India which have promoted a similar high increase. But whereas the very high, or rather the extreme increase (of 112%) is shown for Travancore as a whole and is unaffected by some migration from the coastal plain to the plantations in the hills, from the Bengal districts adjacent to the Brahmaputra valley there has been considerable emigration during the last thirty years. Without this movement of sturdy Muslim cultivators the net increase of Mymensingh (the most populous district in Bengal or India) would show a percentage not of 92 but of over 100. While a readiness to emigrate may be a sign of great poverty where the people are rooted to the land, it does imply that they have still sufficient vigour to endeavour to adapt themselves to changed circumstances in new country, in this case with success.

Around the plains of Assam the forest fringes are the haunt of malign fevers, and increase would have been by no means so high without the immigration of these Bengali Muslims, who have turned seasonal swamps of high grass into paddy fields. Thus at the western outlet of the Brahmaputra valley population has risen by 97% to 220; while in the extreme north-east the population has risen by 325% to 170, a rate exceeding that of most of the canal colony districts of the Punjab. The hill forests east of the Bengal plain doubled or trebled their thinly scattered population. The Duar or hill-foot district of Bengal (Jalpaiguri) has increased by 60% to 330, an indication of the influx of rice-cultivators and of tea coolies which is continued eastward in the Assam Duars. In 1931 Assam's population of 9,249,000 included a net gain of 1,241,000 born outside the province or over 16% of the total. Except for small units like Coorg (a province only in name), this is the highest proportion of any province of India.

The Ganges Valley Plain (*Bihar and U.P.*).—Throughout the long-settled ricelands from the Bengal border westward to Oudh the densities are high, being 900–500. The population of this great tract has stagnated along the Ganges' banks, and only increased to an average of 25% in the foothill districts bordering the malarious but well-watered *terai*. In one rice tract of three districts forming the eastern salient of the United Provinces the population has actually decreased by 5% to 700; for though the floods are fairly abundant and can be damaging, they do not bring a greatly enriching deposit of silt, the out-turn of rice is none too high, and malaria is endemic. Even the irrigated alluvial fan of the river Son, on which Patna stands, shows rural stagnation, with a density of 900. Farther west, with a rainfall of 35–25 inches, the curse of the soil is the deposition of salts, owing to the rise by capillarity of water to the surface after irrigation and its evaporation there. Thus in spite of the alluvial soil and level surface, the proportional area cultivated is small, having actually shrunk; and it is only north of Agra, in the districts on either side of the Ganges, that the population density of 500–600 has been reached by a very moderate increase of 10–20%. In the plateau south of the Jumna–Ganges a notable difference is seen between east and

west. The increase in the north-eastern plateau, where the rainfall is over 50 inches, is due to forest colonization by primitive folk. It contrasts with an actual diminution of population (of 0–10%) noticeable west of the Son to the boundary of Delhi in almost every district, whether British or Feudatory in status. On this, the north-western plateau, long-established settlement has removed the forest cover on the thin and rocky soil of the waste land around the fields, ruining even these; and where there is deep alluvium at the confluence of the plateau rivers with the Jumna–Ganges, this has been gullied by torrents falling from the upland *bangar* level down to the level of the narrow flood plain or *khadir*, 80–40 feet below. Following this actual diminution of cultivated surface and a lowering of the water-table, droughts and decrease of population were inevitable. Both in Bihar and in the United Provinces emigration has exceeded immigration. Hydro-electricity, generated by major Himalayan schemes or by low falls on irrigation channels in the plains, is becoming available for industry.

North of the Gangetic plain the Himalayan rainfall is well over 40 inches. But from the home of the primitive folk living almost undisturbed in their forests on the North-Eastern Frontier Tracts to that of the Hindu (and Muslim) peasantry found from Nepal to the Simla Hill States, there is a vast difference in the intensiveness of colonization and in the pressure on the soil. For Nepal statistics are lacking, but indications are given by those of the hill districts and states on the west, and on the east by those for Darjeeling district and the state of Sikkim. On the west a density of from 80–100 has been reached by considerable to rather high increases of from 54 to 74%. In Kashmir State, to judge from reports and statistics from 1891 only, the population in the half-century would seem to have increased by some 50% in the long-settled basins and valleys of North and South Kashmir districts. Increase was slower in the foothills, but more rapid towards the mountains following their colonization. East of Nepal, in the mountains and valleys of Sikkim, a density averaging 40 has been reached at an extremely high rate equivalent (latterly at least) perhaps to 300% largely by the immigration of hardy Nepal cultivators. They clear and till the slopes for the native millets and the exotic maize and potatoes, and ultimately build terraces for rice, where the Bhutanese of Sikkim had to a greater extent been content to pasture their herds in the woodlands. To judge from their vigour, in colonization as in battle, the people of Nepal must have increased considerably, like their kinsfolk under British administration in the Kumaun Hills to the west; and in spite of emigration we are safe in estimating this increase at 50–75%. Darjeeling district with its tea-gardens and sanitaria has increased by 100% to a density of 200. In Bhutan statistics are lacking; but there must also have been a considerable increase, both by the growth of the natives of Bhutan and by a notable influx of Nepalese.

The Punjab and the North-west.—In the Punjab we can trace how population has moved south-westwards, from the Jumna banks and the foot of the Himalayas, following the extension of irrigation. The long-settled submontane tract, some 20 miles in width from the hill-foot, lies within the isohyet of 30 inches of rainfall. In this light-soiled tract, rather too high-

lying to be reached by canals, densities of 320–400 have fluctuated. Thus a net decrease is found next the Jumna (in Ambala), and low increase westwards to Jhelum (beyond the Jhelum river). Whereas in the upland district of Jhelum gullying and soil erosion seem largely responsible for the stagnation of population, in the other mountain-foot districts sand deposits from the denuded Siwaliks have diminished fertility. To both these problems enlightened forestry is turning its attention. The next belt is characterized by districts of low increase interspersed with a few of but little change, from Karnal (by the Jumna) through Amritsar. At the southern fringe of the long-settled zone, in the belt passing through Lahore, drought and famine were once all too frequent and density low; but the zone having been watered during the last fifty years by an extending system of canals, population has increased by 50–80%, to 300 or more. Lahore city has almost tripled its population. Farther south the once scattered population, composed of cultivators by the riversides and of goat and camel herders in the intervening steppe, has increased by 75–100% or more, to extremes of over 300. In the extreme south of the Punjab plain, to which perennial irrigation has only latterly extended, population has increased, in Bahawalpur state for instance by 70%. The mean density attained in this state (60) and in its neighbour, Bikaner (Rajputana Agency), merely averages the contrasted densities of the still unirrigated and thinly inhabited portions and of the newly settled canal colonies. Southwards in Sind, increase as a whole has been considerable, ranging from 45 to 70%, with densities of 125 and over, excluding the steppe districts or tracts of the Thar. In the Thar Steppe, the western salient of the Rajputana Agency includes the state of Jaisalmer which appears to have dropped at a rate of nearly 30% partly by emigration. The mean density of only 5 indicates the desertic nature of this great sandy plain. While the vast irrigation schemes of the Punjab and of Sind have thus produced a high rate of increase, and the new schemes promise some further continuance and extension, it should not be forgotten that the danger of saline efflorescence is grave, for understanding of the processes involved is incomplete and remedies are uncertain. Hence even here the future is not without anxiety.

In the frontier districts of the Punjab, and beyond this in the North-West Frontier Province, the increases are rather moderate to very considerable and range from 35 to 65%, giving densities of from 100 to nearly 300 in all but the outermost fringes. The people are vigorous; and while the women stay at home on the land the men are able to earn outside their home districts as soldiers, watchmen, and labourers and to bring back money. In the North-West Frontier Province irrigation has been developed from the Kabul and Swat schemes. On the high, arid plateaus and basins of Baluchistan one can only guess at the severe conditions of the last half-century from inaccurate figures for recent decades. These show a density of 5 and a decrease of 10% for much of the area, modified by special increases in Quetta and in a few other parts of denser population.

The East Coast: Lowland and Ghats.—Continuing our survey of the densely peopled regions of India, let us review the conditions along the coastal plains of Orissa and of Madras, together with the south-eastern lowlands to the

borders of the Mysore plateau. The deltaic plain of Orissa, long peopled but subject to alternations of severe flood with lack of flood-borne silt, has fluctuated in its numbers. In 1931 it had only reached a density of 500–700 by increases of 5%, at its margins, to 20% at its irrigated core in the district of Cuttack. In 1934 Cuttack town became the capital of the new province. Simultaneously the Feudatory States of the north-eastern plateau, hitherto attached to the adjoining provinces of Orissa, Madras, and the Central Provinces, were grouped as the Eastern States. Control of the floods and irrigation from the river Mahanadi is in preparation with a view to preventing flood damage while utilizing flood water for agriculture; simultaneously anti-malarial measures are being undertaken. Although the figures for the Orissa Feudatory States which cover the first decade of the half-century may over-emphasize their real growth in contributing to the very high average increase (of 93%), we may judge from a couple of included British districts that population in these lands of hill, forest, and valley clearing has everywhere increased at least by 40–60% and usually more. This increase has given a density of rather over 150; as a whole the States show an increase of 17·5% for 1921–31, the natural increase being reinforced by immigrant colonists.

For the Presidency of Madras, district figures for 1931 are unfortunately not strictly comparable with those earlier than 1891, owing to intervening changes of boundary and area, and hence of numbers. In order both to complete this comparative survey of trends in India, even in broad outline, and also to test my methods with a view to their future use for the half-century from 1891 to 1941, I was forced to fall back upon an assumption of which the defects but also certain advantages should be noted. It should be explained that, for the province as a whole, the decade 1871–81 showed a decrease (of more than 1%) which reflected the great famine of 1877–78. The following decade, 1881–91, showed a corresponding increase of 15%, "a rate never reached before or since." The net absolute increase in the twenty years from 1871 to 1891 was thus less than that in the ten years from 1881 to 1891. Now the assumption made here is that the rate of growth for any district from 1881 to 1891 corresponded to the average decennial rate from 1891 to 1931. The first effect of this assumption is to understate the rate of growth from 1881 to 1891, and therefore the growth from 1881 to 1931; but, at the same time, the mean of the twenty years' change from 1871 to 1891 is approached, eliminating the contrasting tendencies of the two decennia 1871–81 and 1881–91. In this way the suggestion which might be conveyed that the net increase from 1881 is to be thought of as a more or less prevailing tendency or regional characteristic, enduring for a couple of generations or more, is avoided, much as it would have been if we had been able to smooth the true figures from 1871 to 1891 or 1931. Further, by thus smoothing away this first phenomenal increase after 1881, we allow the later of the vicissitudes to be measured (as percentage variability) to stand out in relatively stronger relief, and these concern us most: notably the effects of the famine preceding the census of 1901 and the scarcity and influenza epidemics before that of 1921. The famine losses in 1877–78, it should be said, were severest in the Deccan and, if we may trust the earliest figures, this division had a smaller population in 1891 than twenty years before. Calculating the percentages (from figures in

the Provincial Census of 1901) one finds that even in 1891 Cuddapah and Kurnool were still 10% below their populations of 1871, Bellary 0·1%, and Anantapur 5·4% below theirs.

But while the net changes of districts in Madras can fairly be compared with one another upon this basis, the assumption made seriously weakens comparisons of net change for the half-century which might be made with neighbouring districts beyond the provincial boundary. Exception may be made of the south-western coast, where famines are hardly ever found. The population of Mysore State, it would seem, fell by 17% from 1871 to 1881 and had not recovered its former numbers even by 1891. It is to recovery from such previous loss that, for instance, Chitaldroog district (north-east Mysore) owes its subsequent extreme increase (106% in the half-century). From 1871 to 1881 Chitaldroog had lost nearly 30% of its population, and had still 5% to make up in 1891. In the south of Bombay Presidency famine losses were widespread in the intercensal period 1871–81, both in the crystalline Deccan tracts (along the southern boundary) and northwards in the more southerly districts of the region of Deccan Lava (or Trap). By 1891 there had been rapid recovery of numbers in almost all districts. Similar conditions to these prevailed in southern Hyderabad State before and after the same famine though there was no census before 1881 to record the fall. Bearing these limitations in mind we may resume our survey.

Southwards towards the Godavari and Kistna deltas, along the coastal plain and the hill country of the Eastern Ghats which overlooks it, we find a similar difference between relatively slow increase in the lowlands and high increase in the forested belt of hills behind. In the Kistna and Godavari deltas however irrigation has been more effective than as yet in the delta of Orissa. The three deltaic districts have risen by from 62 to 78% to densities of 350–450, suggesting a still higher increase upon the actual delta areas and their key towns.

South of the Kistna delta we pass inland from the ridged coastal lowland of Nellore (with the irrigated Penner Delta) to the enclosed valleys and low plateaus, studded with whale-backed hills of granite and gneiss, which compose the southern portion of Telugu-speaking Madras. Most of this tract has a rainfall of from 35 down to only 20 inches inland. In spite of the careful husbanding of local water in the valley bottoms for rice and fruit crops, to supplement the millets upon the uplands, and of an expensive attempt to turn the fitful Kistna to irrigation even on the plateau by the Kurnool Canal, this region is subject to famine. If the total rainfall in a given year approaches the mean and falls fairly evenly, both early with the south-west and later with that of the north-east monsoon, the uplands have enough and the tanks too are filled; but shortage spells scarcity and repeated shortage brings famine. By increases of 25–30% the population has only reached 130–200 in most parts, but the districts of Bellary, in its rain shadow, and of Cuddapah only increased by some 10%.

South and south-west of Madras City, in the lowlands, studded with inselbergs, which rise gently towards the foot of the Mysore plateau, the rainfall is higher, except in the lee of Ceylon. Moreover the taming and capture of rivers fed from the Nilgiri and Cardomom Hills, rain-drenched for much

of the year, have increased the available water supply, reinforcing the ancient tank irrigation system of the South. There are famine tracts no doubt, and the lateritic and rocky upland of Pudukottai State has only increased by 9% to 340 p.sq.m. The deltaic capeland of Tanjore, in spite of irrigation from the Cauvery, has not progressed beyond 9% to 640. One hopes that with recently improved irrigation and with anti-malarial measures its condition will improve ere long. Agriculturally somewhat overpopulated for centuries past, the three neighbouring districts each show a rather moderate increase of 32% and support a density of 380 to nearly 600.

Emigration is important in the South. Of the 300,000 Madrasis still in Burma in 1931 most were Telugus. The rubber planters of Malaya and the tea and coffee planters of Ceylon have recruited their coolies chiefly from the Tamil districts farther south. Of the 500,000 Hindus in Malaya a majority are Tamils. In Ceylon 95% of the Indian population are Tamils, and numbered 740,000 in 1931. All these emigrants form notable contingents from the 26,400,000 Telugus and the 20,400,000 Tamils found in India.

The Western Coast: Malabar, the Konkan Rice Tract, and Gujarat.—The remarkably high increase of Travancore (112%) and of Cochin (101%) has already been ascribed chiefly to the abundant and almost perennial water supply. The rain falls upon the sandy bars with their coconuts, on the lateritic lowlands with their palms and cassava or tapioca, and most heavily upon the hills with their forests and plantations. From these heights the rivers descend to the valleys and deltas with their double crops of paddy. The introduction of the cassava upon the laterite uplands, gently shelving above the deltaic mud and sand, has acted rather like the potato in poorer regions of north-west Europe, by supplying a starchy food sufficient as a staple to keep the poorer classes alive. Travancore's high increase is not equalled as the plain narrows farther north. As reckoned, Malabar district has increased by only 42% to a density of over 600 and South Kanara by just under 40% to 340, and even in reality by only 50 and 43% respectively.

In the Nilgiri Hills, in which the altitude of the summit plateau helps to combat malaria, the high increase is stimulated by European residence and plantations. This result contrasts with the net decline in the similar but lower scarped plateau of Coorg, in spite of a net immigration balance there of 24%. So high is the incidence of malaria among the forested hills and plantations of the Western Ghats, in Coorg, and farther north in parts of western Mysore (western Shimoga), and in North Kanara, that the population has stagnated at densities of but little over 100.

The Portuguese coastal colony of Goa marks approximately the beginning of the lateritic coastal plateau which forms the Konkan Rice Tract. With paddy in the valley bottoms and eleusine millets on the lateritic uplands, and with a "food grain" supply eked out by fishing, this tract has increased to a density of 250–300 at a moderate rate, by some 30% for the most part but rather less just south of Bombay. In the alluvial coastal plain of Gujarat laid down by the silt from the rivers Tapti and Narbada, the black soils are well known for their cotton, the cash crop which, with wheat, complements the subsistence staple of Sorghum millet (*jowar*). Yet the whole of the Gujarat

plain has under 40 inches of rainfall and as little as 25 inches in the north, and the droughts largely explain the transition from the low increase in the south (Surat, density 420) to net arrest in the north, where droughts are most severe. Non-cooperation with the census authorities in 1931 hardly affected the very low increase (of 12%) for Baroda, to which there was momentary emigration at that date. Apart from this, the higher rainfall caused by the high relief of the plateau edge has encouraged influx into the forest valleys, an influx made possible by control of the jungle tribes and exploitation of the forests.

The Plateau: the Southern Deccan and the Deccan Lavas.—So far we have only touched the fringe of the plateau as affected latterly by contact with and penetration from the plains. It is now time to consider the plateau as a whole. Starting from the south and working northwards let us consider first the Deccan proper, that is the southern plateau with its crystalline rocks and with an agriculture marked by the combination of millets with rice; then the Deccan Trap or Lava lands with their brown and black cotton soils stretching northwards of a line drawn through Goa and the marginal cities of Hyderabad and Nagpur to north of the river Narbada; next the arid to semi-arid uplands of Rajputana and Central India; and lastly the moist north-eastern plateau.

The Plateau of Mysore, roughly corresponding to the State of that name, experienced a notable increase in every tract clear of the Western Ghats and their malarious forest fringe. Owing both to southern position and to altitude the rainfall is over 30 inches, while the season is prolonged, with a double peak due to the successive influences of the south-west and north-east monsoons which are utilized to the full. The four central and eastern districts show an increase of roughly 60% and over, and their densities exceed 200–300 except in the most northerly district (Chitaldroog) where a low density, which even now is only 158, had permitted an extreme increase (106%). As stated, this increase includes the rapid recovery from the famine of 1877–78. River gaps in the north–south granite ridges of Mysore have permitted damming for modern irrigation, supplementing the traditional methods of South India. Migration has brought a net gain to the State. During the last half-century the administration of Mysore has been thoroughly efficient. Farther north (beyond the Telugu portion of Madras) lies the northern margin of the crystalline Deccan, passing through the south of Bombay Presidency, southern Hyderabad, and the southern Central Provinces. East of the rain-shadow area with its increases of from barely 25 to barely 40% (density 150) we pass in Hyderabad to a country with forested hills and with a rainfall prolonged by a second peak, as in Mysore. Although land revenue is higher and administration less efficient than in Mysore, population here too is relatively secure from drought and famine. Hence, in spite of malaria, increase is very considerable to very high where settlement is ancient, and is extreme among the forests. Coal mining is also a factor (in Warangal). Farther north, in the southern Central Provinces, the increase has not been so high.

A most noticeable contrast upon the plateau occurs at the margin where the crystalline rocks have been covered by flows of the Deccan Lavas, with

their coarser red to brown soils and fine black clays which, though retentive of moisture, do not readily permit of satisfactory irrigation and of the resulting insurance against drought and famine. The Aryan speech of the Marathas and their culture, and even their dominant racial type, has been halted at this zone of geological contact by the Dravidian culture of the Telugus and Kanarese, characterized by its valley tank agriculture and by its excessively hierarchic organization of castes, from meticulous Brahminism to utter untouchability. Whatever the cause of this historic coincidence of environment and culture, the barrier of socio-economic organization (still more than that of mere technique or of speech) must act even in famine as a barrier to emigration from the Lava Lands southward to the irrigable crystalline Deccan. Although almost wholly free of malaria (except in a few valleys having Government irrigation canals led from the Ghats) the drier belt of the Deccan Lavas, where the soils are predominantly brown and shallow rather than deep and dark, is a famine tract. Its increases have been generally low, being only 5% in one district north-west of Hyderabad to 15, 20, or 30% elsewhere; its densities, though usually over 100, rarely exceed 200. As we shall see in discussing variability, few tracts show more disastrously the effects of famine by the periodic arrests in the increase of its normally vigorous Maratha people.

Where the Tapti valley widens out in Khandesh to an open plain of black cotton soil an increase of nearly 50% has brought a density of over 250. Some penetration of the forested hills towards the western gorge through which the Tapti finds its way to Gujarat has brought a density of only 120 by a high increase of 80%. Similar increase and density are found to the north-east of this fertile basin (in Nimar). As the rainfall increases towards Nagpur densities exceed 200 by virtue of a rise of from 20 to 35%. Immediately east of Nagpur there is a similar increase on the crystalline rocks.

West of Gujarat the rocky lava peninsula of Kathiawar passes in the north to extreme droughts with a mean of only 15 inches of rain. Politically, Kathiawar is carved into many principalities, making it difficult to ascertain the facts of poverty, but it would seem that the population, now 150 p.sq.m., grew but little, and irregularly, in the last half-century. Emigration has further lessened increase. Cutch on its peninsula, grouped with Kathiawar in the States of Western India, has an even smaller rainfall of only 10–15 inches. It experienced a net arrest.

Central India.—North of the Narbada river, the Deccan Lavas are continued in the Malwa Plateau, with its Sorghum millet, wheat, and cotton. Nowhere more than in Central India is administration hindered by a patchwork of principalities. Each of the sixty-two feudatory states, including Gwalior, may consist of several pieces, carved in the eighteenth century by the swords of allied Maratha chiefs who, after every fresh advance towards Delhi, divided the conquered territory among themselves. In spite of the political patchwork (and the absence of statistics for four small states beyond 1891, the figures for which I have generalized from the surrounding tracts) differences in physical environment can be discerned. On the Lavas increases of 25–50% and over are usual, though some patches show actual decrease. Northwards to the bad lands of the Jumna's banks, already described,

famines, due to drought and to scarcities, and inadequately alleviated, have left their mark in the prevailing conditions of net arrest or decrease. Bhopal shows a severe net decrease of 30%, leaving a density of only just over 100, although immediately to the north in hilly Bhilsa there would appear to have been very high increase yielding a density of 124; migration between these neighbours must have played a large part in creating this contrast. Farther east, in nine or ten districts and states of the northern Central Provinces and of Central India (east) which almost surround Jubbulpore, we find net arrest or marked decrease; this is due in part to droughts, and also to floods, upon the infertile sandstone scarplands of this marginal tract where upland eleusine millets eke out the valley rice. Similarly in eastern Rajputana recurrent famines have wiped out the increases of more prosperous years. In northern Rajputana, Bikaner has recently been watered by the Punjab Canals, and its increase contrasts with the decline in waterless Jaisalmer. In Marwar (Jodhpur) however an increase equal to that of the British enclave of Ajmer (of just over 20%) is not to be explained by physical reasons but rather by the enterprise, not unmixed with avarice, of its traders, who are known as brokers of cotton, grain, or jute from Ahmadabad to Calcutta.

The North-eastern Plains and Plateau.—Turn now to the north-eastern coign of the plateau, from Nagpur to where, at its farthest point at the Bengal–Bihar border, it is rounded by the Ganges. The fairly prosperous conditions in and round Nagpur district are continued farther east, but the rice on the lateritic plain bears rather lower densities of 150–200 (and less in small states in the intervening hill region of the district of Drūg or Droog). In the middle basin of the Mahanadi river (Bilaspur and Raipur districts) with a rainfall of 50–60 inches and a gently undulating surface fringed with wooded hills, the mean density of 160–180 has been reached by an increase of 55 to nearly 60%. Eastwards the Mahanadi breaks through the wooded hills of the Eastern States of Chhattisgarh and Orissa, with an increase of about 100% and densities around 100–150 and over. Much of the Chota Nagpur Plateau consists of rolling surfaces at 1000, 1500, or 2000 feet; and where the basins open out widely densities approach or exceed 400, with increases of 30, 50, or 70%. In the hillier districts the density may be about 200, and less in the states. Where, in addition, minerals have been found and where iron and manganese ore is smelted with coal from the plateau, the increase may be higher still, exceeding 100% and attaining a density of 240 in hilly Singhbhum, and of 440 in Manbhum with the coalfields of the upper Damodar valley. The coalfields of the lower Damodar valley are included within the boundary of western Bengal in Burdwan district, and cause an extreme local increase of population. On the northern foreland of the plateau, long since closely settled, there is of course a higher density (of perhaps 500) but with correspondingly low increases of 10–15%.

Summary.—Taking first the plains, with their dense population, we note that the three tracts of highest increase in all India occur at its extreme points: in eastern Bengal and Assam, in Travancore, and in the irrigated belt of the southern Punjab; while on the contrary low increase and stagnation, interspersed with marked decrease, prevailed from central Bengal for 1200

miles to Jhelum. As in central Bengal, so from Patna past Delhi to the Himalaya foot, every district flanking the Middle Ganges or lying south-west of the Jumna shows stagnation or marked decline. And from this zone of misery there extends a branch in which decrease prevailed from Cawnpore north-north-west to Naini Tal, with its malarious foothills and terai. With these exceptions, the sub-Himalayan districts from the Bengal border to the Jhelum gorge experienced a low to very moderate increase. The causes of this sub-Himalayan increase, such as it is, are somewhat different in the east and in the west. East of the Ganges, the increase marks both the steadier cropping of these better-watered tracts, fertilized by Himalayan silt, and also the immigration northwards towards the terai where landless folk from the south might find fields of their own, though too often at the price of infection from malign fevers. West of the Ganges on the other hand, rural migration tends in the opposite direction, west or south-westwards; but although there is immigration from the hills, this can hardly have equalled the emigration southward to the Canal Colonies in times of famine, and there has been some natural increase.

Along the east coast, except for the considerable increase in the Kistna-Godavari deltaic tract, increase is moderate to low for the whole length, with stagnation in northern Orissa and in Tanjore. On the west coast too, the Konkan Rice Tract shows but a low to moderate increase; and there is arrest and even decline round Ahmadabad.

On the plateau there is a definite tendency to increase south-east of a line drawn from the river Son near Patna, in Bihar, south-westwards to Goa. This is the land of crystalline rocks, fringed with deltas at the coast, and mostly enjoying fair to plentiful and prolonged rainfall, and with wooded hills enclosing valleys which had resisted immigration until the middle of last century. Thus the rice-lands of the Mahanadi valley plain (in eastern C.P.) show rather considerable increases of 55–60%. Surrounding them are forested hills, still of low density but with a natural increase already considerable or high, further heightened by immigration. South of the Kistna increase has been very moderate to low in the Telugu districts of northern Madras around Cuddapah (with its almost net arrest). Most of the remainder of the southern plateau has increased at rates ranging from moderate to very considerable.

North-west of this line from the Son to Goa population has increased at a slower rate or has actually decreased, owing to long settlement, and to drought and famine, particularly from the Narbada valley northward. In the Deccan Lava lands, except in Khandesh and west of Nagpur City in Berar, the net increase is for the most part rather low (20–30%), and some of it far below 20%. Much the same is true in the Deccan Lavas of Malwa. In the remainder of the northern plateau, *i.e.* in Central India and much of Rajputana, increases were so fluctuating and low as to merge into actual decreases as extreme (in Bhopal) as 30%.

2. *Variability in change*

Where a really high increase has occurred, such that at the end of fifty years the population has doubled, it is evident that this increase, if natural, can only

have been reached by a high increment throughout every decade. Such a high, natural increase, measured say at each decade, would be expressed as a smooth rising curve. An extreme increase of well over 100 to 200 or 300%, on the other hand, must have been reached by help of immigration, which tends to start with a rush, giving a sharp upward bend at one or more points in the plotted curve. But where, in some other region, the population figure at the end of the period is much the same as that of fifty years before, this net arrest gives us no clue to what has really occurred during the half century.

In such a case two alternatives present themselves: alternatives of types which are in sharp contrast at their extremes although between the two there can be found intermediate conditions and grades. On one hand, there may have been more or less prolonged periods when numbers rose rapidly and steadily, interrupted by short periods of disaster when, by drought and famine or by epidemics, the population was decimated. Disaster may also lead to immediate emigration, temporary or enduring, sharply diminishing the population. On the other hand, a net arrest of increase may in fact be due to real stagnation. From year to year, and decade to decade, the birth-rate may have been equalled by a high death-rate. In a region of chronic misery such as this, while the people have not all simultaneously met with extreme disaster, yet they have never known health and well-being. Hence, in a region in which the close of a period marked a low increase or a decline, it is imperative to distinguish whether conditions have long been much the same or whether, on the contrary, there has been fluctuation or variability and to what degree. Variability should prove to be a telling criterion of the manner of net change (or of net arrest) throughout a period and provide a clue to the underlying causes. It is essential then to find a formula to express the curve which would be given by a steady rate of change from the figure of total population at the first available date (1881) to that numbered at the last (1931). We can then calculate, as a fraction and percentage, whatever deviations appear from the theoretical curve when the actual figures are taken for the intervening censuses (1891, 1901, 1911, and 1921).

The fact that the net change is derived from the difference between the totals on two arbitrarily chosen census nights, fifty years apart, means that at best the random element is high. When the census of 1941 is taken a comparison of the net changes for 1891–1941 will supply another result for comparison, but only one. With variability this disturbing element is considerably reduced for, to begin with, we derive the particular figure not from the difference at two dates, 1881 and 1931, but from a comparison of those at six dates. As a corrective to figures of net change, variability is particularly valuable in comparing conditions in two or more districts subject to violent fluctuations, as in Central India and Rajputana. Obviously if numbers were temporarily at a low ebb in 1881 and had risen, perhaps temporarily, to a peak in 1931, the net change will tend to be positive. If the reverse is true the tendency will be negative. Yet the general tendency and condition, of slow mean change with marked fluctuations, may really be similar in both cases. The use of totals at six decennial census dates, by greatly increasing the likelihood of including a fair approach to at least one or both of the peaks and

the troughs, correspondingly increases the value of regional comparisons derived from variability.

It will be noted that any widely spaced, regular series of dates, such as those of a decennial census, tend to give a smoother graph than would be given by the real peaks or troughs, for these rarely happen to occur in particular census years. Hence the resulting percentages of decennial deviation from the theoretical curve—that is the decennial variability—far from exaggerating, tend to understate the real vicissitudes of the last fifty years.

The required formula was very kindly devised for this analysis by Dr. A. C. Aitken, F.R.S., to whom I wish to record my indebtedness, as well as to Mrs. Dorothy Morris, M.A. (Miss Drever), and Mr. Robert Oliver, B.Sc., who performed the necessary computations, a work of considerable labour. By Dr. Aitken's method a smoothed curve was calculated without the aid of logarithms by correcting a straight line interpolation. It was assumed that the smooth curve was exponential, passing through the first and last given points (*i.e.* the populations at 1881 and at 1931); and an average deviation of the given values from this curve was constructed, being expressed as a mean of the first and last values. In evaluating the mean deviation it was decided to divide by 5, for it seemed inappropriate to divide either by 6, since of the six deviations the first and last are zero, or by 4, because although we force the terminal deviations to the zero we probably do this at the expense of increasing the neighbouring deviations (*cf.* Aitken, 1932).

We saw that in eastern Bengal the population had increased by 100%. This increase, an indication of uninterrupted normal well-being, has been reached by a curve which departs so little from the theoretical normal curve which we should expect, that the percentages of deviation or variability (v) for most of the eastern districts are no more than 0·5–1. That of the highest, Mymensingh, is less than 2%, and even this is a comment on recent emigration rather than natural change. In the heart of central Bengal however, where the decline has amounted to 14%, v is no greater than 0·5%, a most telling indication of regularity in the decline. In the famine districts of the Deccan Lava lands in western India, we noted a rather low increase characteristically of about 25%. There the percentage v is very great, being 5, 6, or more per cent., and reaching extremes of 14 or 15% in certain of the small feudatory states in which no proper measures were taken for famine relief. In Rajputana, whatever the net results or change, v is still greater, with 11 and 12% in Jaisalmer and Marwar. Even Ajmer and Jaipur, with almost the lowest in the Agency, show 5·6 and 5·7%, while the highest figures reached (in two states named later) appear to show approximately 14%. While no undue importance should be attached to the percentages given for any particular state, both because of the doubtful accuracy of enumerations in the early years and the small population of many states, and also because of the random element involved in taking only six decennial dates, I feel that the general impression given by the figures for these states, as a group, cannot involve much exaggeration, relatively to other regions. We have noted their net arrest or decline as a whole, and it has already been remarked that the tendency throughout is to understate the absolute variability owing to the limitation to six census dates. These examples, taken at the outset, give us an idea of the

range to expect. We may now describe a v of 0–1% as *minimal*, of 1–2% as *slight*, of 3–4% as *moderate*, of 5, 6 or 7% as *great*, of 8, 9, or 10% as *notable*, and 11% and over (to nearly 20%) as *extreme*.

There should be no confusion of areas with a high natural increase and, by that fact, a low variability with chronically stagnant areas where low v accompanies low increase or actual decline. The regions are briefly dealt with in the order in which they have already been taken.

Regional variability.—In the Bengal Plain we noted the contrast between the very high increase in the well-watered and fertile east and the arrest (or even marked decrease) in the west. The continuity typical of that arrest for fifty years past was demonstrated, as we saw, by the low v of from 0·5% to no more than 3 or 4% in the west. The fact that in the west of the delta proper the highest v reaches only 2·5–3% reflects the freedom from the occasional extremes of scarcity, approaching famine, which have occurred on the lateritic slopes towards the provincial border where v reaches about 4% (rather moderate). Two exceptions must be noted in Bengal, both with a great variability. One is Malda, divided from the jungles of the plateau only by the Ganges where it bends seawards. In this upland district population has increased irregularly, largely owing to the relatively recent influx of Santal aboriginals. The other district is Jalpaiguri in the north, with a considerable increase, where a great v is attributable both to malign fevers and to immigration, chiefly to the tea plantations of the Duars.

In the plain of Bihar, although severe floods have at times brought severe scarcity, variability is generally rather slight, though it is rather moderate in the west. Patna is the only exception, with a high value due to losses ascribed chiefly to plague, which has spread from farther up country (to the west), perhaps through its chief city. The loss of life subsequently due to the earthquake of 1934 was, luckily, small, and so was the ultimate damage to the land. In the north this slight variability is maintained westwards to the limit of rice as a staple crop in the United Provinces, on the banks of the Sarda-Gogra. Immediately beyond the present Sarda river the low increases have generally corresponded to great variability, being all of over 4 and most of 5–6%. But the Sarda irrigation scheme, lately inaugurated and fanning out upon this tract (the alluvial cone of the original river), should both add to the increase and diminish the variability of this area and of the districts lying to the south, around Lucknow. By the Ganges, from the Bihar border west and north to the Jumna gorge, we saw that increases, though rather low, were to be found; and these are associated with moderate to rather great variability (of 3 and 4, and of 5%).

In the Punjab the very low increases and stagnation which mark the Sikh States and the adjacent districts of this tract of water-parting have been generally accompanied by rather moderate to great v (4, 5, and 6%) due to famine in the earlier years of the period, and to plague. The long-settled tract from the hill foot to Lahore with its rather low increase, shows the fluctuations to be expected both from a low rainfall, droughts, and famines, and from the relief found in such crises by emigration to the canal colonies of the south. We saw that in these colony districts changes from arid steppe to

cultivation gave increases exceeding 100%; and as the inauguration of settlement brings an immediate influx, followed by later pulsations partly due to famine-driven immigration, we find extreme v, approaching 20% in Montgomery. Along the Indus the moderate to rather low increases have generally been accompanied by moderate to great variability.

In Sind the moderate to high increases have been accompanied by setbacks, owing in great part to the irregularities of inundation irrigation before the creation of the Sukkur Barrage. Although the province has suffered less from famine than others which have depended almost wholly upon rainfall, my impression is that its great to notable variability, directly due to sharp increases since 1881, is partly caused by recoveries from earlier sufferings and partly by immigration. For Baluchistan statistics are lacking, but the differences which have probably prevailed in the conditions of different states of the Agency and also the migratory habits of many of its people must have led to extreme values throughout.

In the Himalaya we have data for the British hill districts of the Punjab and United Provinces; and these show that their low to moderate increases have been reached by slight to moderate variability. Darjeeling's increase of 100% is associated with a great v of 6·7%; the artificiality of its economy makes these two figures no fair criterion either for Nepal, Sikkim, or Bhutan. The rather high increase associated with great v (of 5·8%) cited in the Bengal Duars (Jalpaiguri), indicates the conditions to be expected in the similar Duars of Assam.

On the east coast the Orissa delta shows moderate to rather great figures at the less fertile outer flanks, where malaria and cholera were notorious; but very moderate v is found where the increase exceeded 20% in the middle of the fan, watered by canals but subject to floods. Inland, the British districts included in the Orissa Feudatory States (grouped, since 1934, with others as 'the Eastern States') show slight to moderate. One finds considerably greater percentages for the states. Farther southwards we pass into the province of Madras for which, as noted, the basis for calculations was somewhat smoothed. For this difference, about v 1% may be added if comparisons are made with districts outside the province.

To the edge of the Godavari delta, along the rocky lowland where increase was rather low, variability has been slight. The highland portions of these coastal districts, with Koraput, show great variability. In the deltaic districts of Godavari and Kistna high increase has been reached with slight variability. Moderate to great v marks the high increase of the two adjacent districts of the Nizam's Dominions, suggesting irregular colonization of their forests. South of the Kistna, Nellore shows a moderate v, while in Telugu-speaking Madras it passes from moderate to great as we go inland, where Bellary records its famines in its almost extreme 10·4%. Among the Tamil districts farther south there is least v in two contrasting districts: the steadily growing district round Madras city (Chingleput, 1·8%), and the dense but stagnating population upon the rice plain of Tanjore (2·3%). And while the relatively arid upland of Pudukkotai state, adjacent to Tanjore, also showed a net arrest, yet the contrasts of its environment and life are demonstrated by Pudukkotai's very notable variability (10·5%). We saw that for the remainder of Tamil-

speaking Madras the increase was moderate to considerable. There, except in the extreme south, in Tinnevelly, and also inland from Madras in prosperous North Arcot, where deviations were slight, the variability was moderate to great, an indication of scarcities and of migration.

Rounding Cape Comorin, we find that Travancore's remarkably high increase, being mainly natural, could leave no doubt as to its variability, which is minimal. Some local qualification of this statement should be made regarding the variable rate of colonization in the hills, accompanying vicissitudes in the plantations of coffee and rubber. Farther north, in Malabar and South Kanara, moderate increase was accompanied by very slight *v*, while in the forest fringes of North Kanara the net arrest was brought about with rather moderate *v*, though that of Coorg was slight. In the Konkan rice tract the low to very moderate increase accrued with moderate *v*. In Gujarat, the conditions of Surat, with its very low increase and very moderate variability, contrasts with those farther north (to Kaira), where an actual decrease is marked by great *v*.

The Mysore Plateau with its generally moderate to high increase shows moderate to great *v*. It is great both where the increase had been high (Chitaldroog in the north, *v* 5·6%) and also where it was low (Kadur 5·9 and Hassan 8·4%), but it is least with the virtual arrest in the rainy north-west (Shimoga 2·9%). In the western districts of the plateau of which the forest margin overlooks the sea, its extent differs greatly with the locality; and it must be remembered that as the transition from the rainy Malned inland to the dry 'rain shadow' zone occurs in a belt only a few miles wide, a district is too large a unit to exhibit the regional vicissitudes. Farther north the rather low increases in the crystalline Deccan tract of Bombay Presidency were also explicable by their great *v*. The Telugu-speaking districts of south-east Hyderabad with their millet and rice crops, show that their increase (considerable to extreme) was generally reached by great *v*. This must in part be due to migration from more open and longer cultivated lands immediately south of the Kistna. North of the Godavari gorge, too, the extreme increase of the Bastar highland came with great variability. In general, while the more open tracts of the higher plateaus, with their moderate density and considerable increase, mostly experienced great to extreme *v*, the more forested tracts towards the scarps of the Eastern Ghats have increased at a high to extreme rate, and more steadily, having a variability which is only moderate to rather great.

In the Deccan Lava lands of Bombay and Hyderabad, with their rather low net increase, variability, although moderate in the best soil tracts of the Central Provinces (where it accompanied considerable increase), is generally great to very great. This is essentially due to the lamentable alternation of years of good rainfall, both plentiful and well distributed, with years in which rainfall may be altogether lacking during the weeks or months when moisture is needed for the growth of the staple millets or of cotton, the great cash crop. In the rain shadow belt east of the Ghats, the annual mean, or so-called normal rainfall is below 20 inches, while the median, or most frequent annual amount is usually found to be well below this mean. Although the deeper, black cotton soils are retentive of moisture, the subsoil conditions

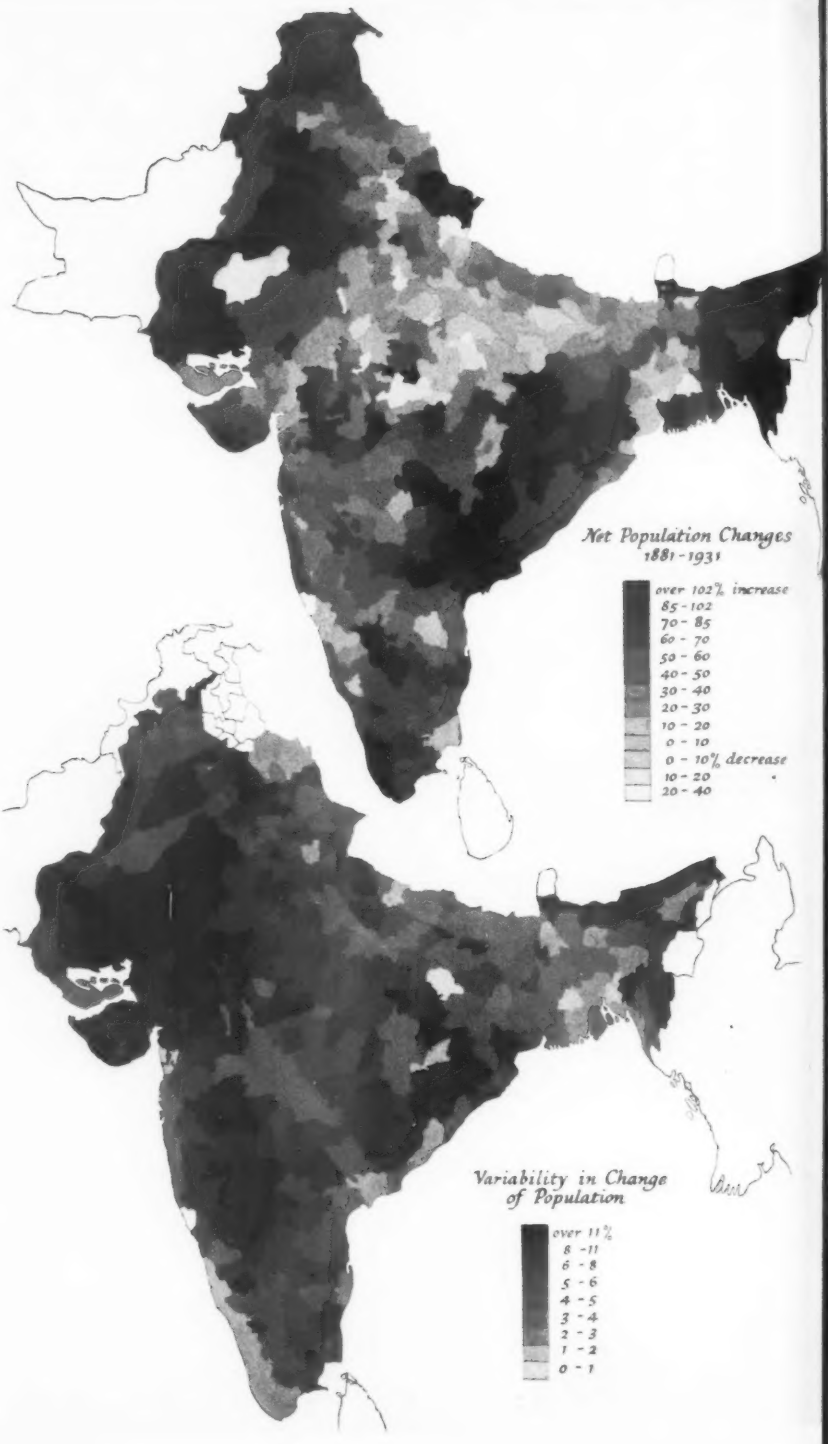
do not lend themselves readily to irrigation, rendered the more difficult by relief and other factors. Evaporation in the dry season is high and in winter the frosts can be quite keen. As a result, while the normal health is sound and increase occurs at a high rate when harvests have been good, famines have been disastrous, and in 1899–1900 the mortality was high. Without the relief works set up at that time mortality would have been still higher, particularly among landless labouring folk, and hence the variability would also be still greater. It was after the experience of this famine that Government arrangements for foreseeing crop failure and dealing with the results were thoroughly overhauled. During the ensuing years, moreover, the extension of irrigation and transport and also the increase of ordinary credit facilities and of mobility of labour, tended to help the population to tide over failures. Thus in 1918, although crop failures were serious and widespread in the Bombay Deccan and the Marathwara of north-west Hyderabad, the mortality directly due to starvation was insignificant. In 1918–19 however the mortality due to influenza was severe and extreme poverty must have increased the mortality of those infected. Apart from such epidemics, we must not forget that liability to crisis in these areas is no new thing, nor is it likely wholly to vanish, so far as can be seen. Indeed the crises passed through in an earlier period must have their effect in this one, from which in turn this tendency to marked variability will be passed on to later periods.

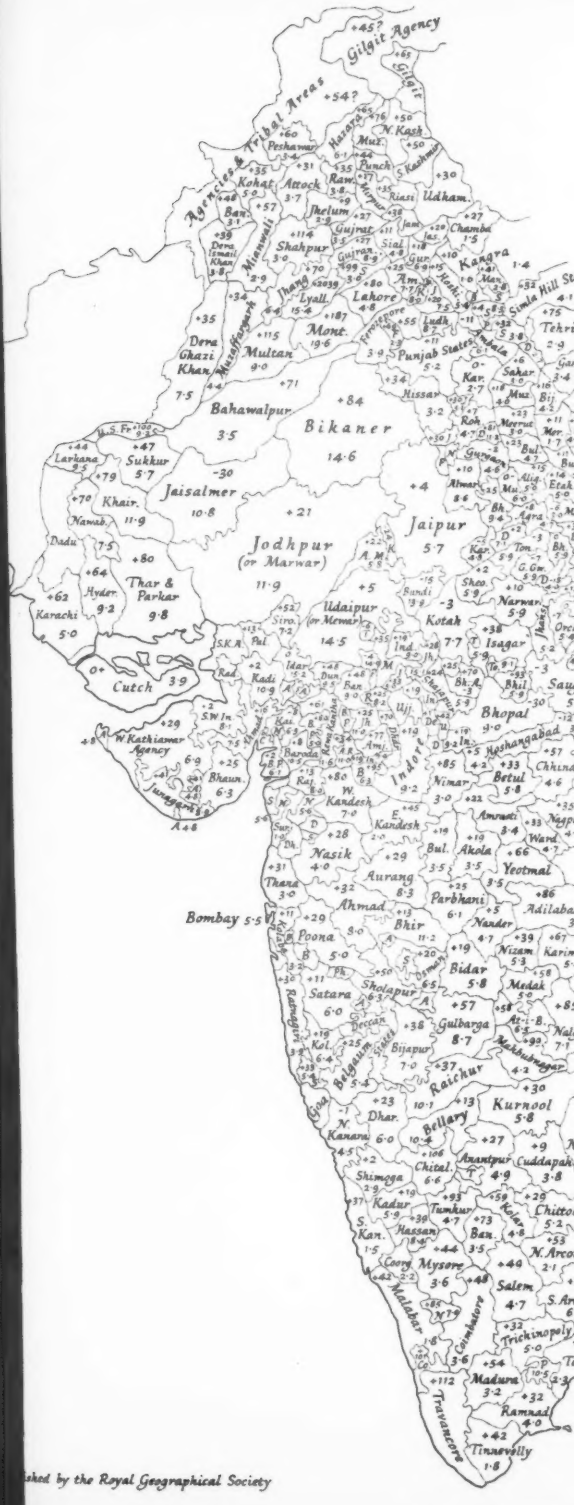
In the sparsely populated States of Western India (the peninsulas of Kathiawar and Cutch) low to moderate net increase or actual decrease has generally resulted from the setbacks of early famines and later influenza. This is evident for many states from the dates of greatest deviation, which are usually negative, and for most states v is great to notable.

Variability in the Deccan Lavas is slight only in the Tapti valley plain, *i.e.* in East Khandesh and immediately around it. North-west of this, along the forested hills, the high increase seems to have taken place in spurts, for it exhibits extreme values; but enumeration among the Bhils may have been imperfect in early years. In fertile Berar (southern Central Provinces) the mainly moderate increase has been accompanied by moderate v (average 3·5%). Eastwards to Nagpur, with moderate increases, v has been rather higher (4·1–4·7%). Near the Mahadeo Hills it is rather great (Betul and Chindwara). Still farther east it has been great, owing chiefly to the famine of 1899–1900 (Chanda, Drug, Mandla).

The vicissitudes which have caused the arrest prevalent in Central India and Rajputana are reflected generally by the great variability. Although early statistics are somewhat unreliable (though published for all but four small states, for which I have assumed an average figure), and while the patchwork of states requires care in plotting, the figure does give statistical expression to the undoubted fluctuations in the population of this region.

North of the Narbada, on the Lava plateau of Malwa, v as we saw is high; in Indore, for instance, with low increase, it is notable. Much the same is true for Gwalior's scattered districts which show v averaging 5·9%. In Rajputana, as we saw, among the highest figures in India (apart from immigration areas) appear to have been reached in Jaisalmer and Marwar with 10·8 and 11%, and Bundi and Mewar (Udaipur) respectively 13·9 and 14·5%.


Net Population Changes
1881 - 1931
over 102% increase
85 - 102
70 - 85
60 - 70
50 - 60
40 - 50
30 - 40
20 - 30
10 - 20
0 - 10
0 - 10% decrease
10 - 20
20 - 40
Variability in Change of Population
over 11%
8 - 11
6 - 8
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0 - 1



shed by the Royal Geographical Society

Population Changes in India 1881-1931

Whole numbers show increase or decrease per cent and numbers to one decimal place variability per cent in these changes

Towards the almost mountainous margin of the Chota Nagpur Plateau (formerly in north-east Central Provinces but now the most northerly Eastern States), high increase has been marked by great *v*. Outside the mining areas in the plateau regions of Bihar, considerable increase is associated with moderate *v* in two northern districts and almost none in a third (Palamau); while with high to extremely high increases in Manbhum, with its great additional resources of coal, and in Singhbhum with its ores and metallurgy, *v* has been rather slight. In the extreme north-east of the plateau a moderate increase has accompanied moderate *v*. It would appear that a certain resilience of resources is provided both by the variety of crops, and of jungle produce when crops fail, and also by the choice of various types of seasonal and temporary migration to the tea gardens of the Duars or the paddy fields of the plains, and to labouring tasks in Hooghlyside or in the mines of the plateau.

Cities.—Although their total population is but a fraction of that of rural India, cities and towns deserve separate mention. Of the seven largest cities of India proper, Lahore (430,000 in 1931), by an increase since 1881 of 188%, had most nearly approached the increase of Rangoon (400,000, increase 198%); Delhi (447,000) followed with a growth of 158%, Calcutta with Howrah (1,485,000) increased by 79%, but Bombay (1,161,000) by only 50%. Madras (647,000) increased by 59%, Ahmadabad (about 380,000) by about 161% (from figures I calculated from the municipal census of 1932), while Hyderabad, Deccan (467,000), increased by only 37%.

Although variability has only been calculated for the larger cities, one is safe in saying that for many or most it is great to extreme. That of Calcutta and Howrah, it is true, is rather slight (2·9%), but most of its population is drawn from areas of slight *v*. More typical is Bombay (5·5%). In time of famine in the Deccan, Bombay's factory gates by day are crowded with coolies seeking work, and the street pavements are lined by night with their sleeping bodies; such were the conditions in 1921. During an industrial depression like that of 1931, the emigrants go back to their villages. The last decennial increase of Lahore to 1931 at once suggests a great to extreme *v*; in fact it is 10·9%. That of Delhi gave an extreme (11·2% for the Province), for the establishment of the capital in 1911 meant a sharp upward change in the rate of increase. As in Lahore and the United Provinces the irrigation of cotton had helped the textile industries of Delhi. Madras city was rather moderate (4·4%) like that of Karachi (4·1%), while Ahmadabad was great (6%). Hyderabad was 9·7% and a much smaller capital, Mysore, was also notable (10·7%), while Bangalore (possibly as a result of evacuation during plague in 1911) was 19·7%. In smaller cities the figure must often be great to extreme, both because of flight to rural areas in times of epidemics and because of the large numbers commonly described as floating, although in view of their misery and their high mortality the state of many would better be described as sinking.

3. *Conclusion. Types of variability and change*

While every one of the numerous districts had its own vicissitudes, it is possible to make certain broad descriptive generalizations from the associations of variability with change.

We noted in Bengal that extreme natural increase with minimal variability in the east were opposed to stagnation (*i.e.* arrest almost without variability) in the western delta, though variability was moderate just beyond the delta's western margin. In the rice tract stretching north-westwards through Bihar and the United Provinces to the Sarda river, moderate increase was generally accompanied by slight v; in Assam, on the other hand, the recent rush of immigration has caused the high to extreme increase to be marked by high v; the same was true of the low, forested ridge country bordering eastern Bengal. The rice lands to the south, in the deltas of Madras, were alike in showing slight v, whether there was arrest of growth, as in the delta of the Cauvery in Tanjore, or whether the increase was considerable to rather high, as in the deltas of the Kistna and Godavari. But where rice has been pushed to the limit of an irregularly available water supply scarcities recur and v is generally moderate to rather great, even though increase is usually considerable and, in newly colonized lands, may be rather high. In the Lava lands of the plateau we noted that moderate increase was the result of a chequered, variable ascent, and we saw that in the Agencies of Rajputana and Central India extreme v accompanied the net arrest of population so general except in Malwa (Indore, etc.). In the millet and wheat lands of western Oudh and Agra, north-westwards to the Jumna gorge v was usually moderate both in the upper Doab, with its low to moderate increase, and along the western banks of the Jumna, with their stagnation. In the Punjab, moderate to great or very great v marked the sub-Himalayan districts, from which so many cultivators are moving southwards to the canal colonies; and in the latter the influx of colonists has sent the population figure leaping up, and with it the curves of variability. These comparisons thus take us further than the simple contrasts of net change alone, with which we began. They should help us in the interpretation of regional capacity for increase of population.

To sum up, I believe the criterion of variability in rate of change, though highly suggestive at all rates, to be most helpful where the percentage change is lowest or falls to a decline. For these regions are the hardest hit, but in ways so different that diagnosis is essential. Recognition of stagnation where both increase and variability are virtually nil is, I think, particularly necessary; for there misery, being not occasional and catastrophic but perennial, fails to draw attention to itself and is left untended. This has been most notably true among the densely packed but stagnant population of the least prosperous of the rice tracts of the Indian plains which extend from central Bengal to the eastern United Provinces or southwards to the delta of the Cauvery.

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A STUDY OF THE CONFLICT BETWEEN THE REPUBLICS OF PERU AND ECUADOR

L. A. WRIGHT

THERE is a suggestion that when a cause lasts for a long time, it must be about something proportionately small: for if it were not, it would be in the interest of the parties to hurry it to an end. But this is not the case here: the dispute is at once venerable (being well over a hundred years old) and important. Important to Peru and Ecuador in that it involves more than 100,000 square miles of valuable land, and important to everyone else in that, until it is settled, the general constitution of the Americas remains incomplete, and solidarity between all American states merely sentimental.

There are three territories which go to make the matter of the quarrel.

First, there is part of the province of Tumbes on the Pacific seaboard, an area perhaps 30 miles long and 50 miles wide. It is a desert, and in itself would be worth nothing, were it not that four rivers cut across it. These, as though to aggravate the politics, change their courses with the years, and this has the double effect of queering boundaries and of giving the lands some value, for the old river beds are good for growing tobacco.

The next area, the province of Jaen, sometimes called Jaen de Bracamoros, is completely different. In area it is about 4000 square miles and it lies directly to the east of the Cordillera of the Andes, that is, on the opposite side to Tumbes and the Pacific. The River Huancabamba, a tributary of the Marañón and thence of the Amazon, flows round three of its sides.

Jaen is a land easy to admire and difficult to make use of. There is good soil in which almost anything will grow: maize, tobacco, cacao, cotton, rice; but ravines and bad weather stand in the way of all traffic. Raimondi, the geographer of Peru, who visited it in 1868, remarked of it that in dry weather you stick in the mud and in wet you drown. There are no roads in Jaen to this day, but two pueblos on its western edge are now joined by road to the Pan-American highway.

There are mists, damp woods, small plantations, and deserted townships in

Jaen. These last have come about, not so much because people have died, as that they have changed their minds; there is a trace of nomadic spirit in the Indians. When Raimondi visited Jaen he found that the capital had already twice changed its site since the time of the Spanish dominion, having finally moved itself into a bog. This shifting may account for the fact that the early geographers are always wrong in their bearings of the pueblos.

The position of Jaen in the dispute is that it is the most Peruvian in fact and perhaps the most Ecuadorean by right.

The third province, which usually goes by the name of The Oriente and sometimes Maynas General Command, is by far the largest of the three, being well over 100,000 miles square, by far the most valuable (wood, petrol, rubber) and by far the most difficult to allot. In shape it is a great fan whose ribs are the head waters of the Amazon and whose edge is the Ecuadorean part of the Cordillera of the Andes. The south-western and north-western zones of the Oriente, those which lie along the Cordillera, are called Macas and Quijos.

The population of this empire of forests and rivers is always matter of doubt. The people move from one place to another, though with more method than the people of Jaen. Villavicencio, the Ecuadorean geographer, reports that the fruits which grow on the banks of the Amazon rivers ripen at the opposite time of year to those which grow on the higher lands towards the Andes, and that in this way there is a continual succession of harvests for the animals and for the people who shuttle to and fro in order to gather it. Be this as it may, a true census cannot be made because most of the people are in the depths of the forests and decline to come out.

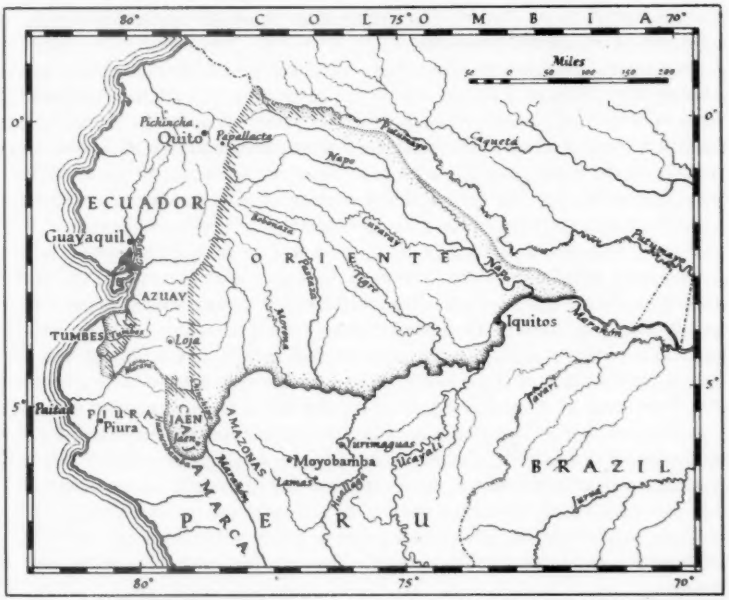
Other than by air there is no means of getting from one part of the Oriente to another except by the rivers, so that the few pueblos are built near or on the waters edge. In the seventeenth century, when the Jesuit missions were at their height in these parts, the Fathers succeeded in drawing a good number of the Indians out of the forests and established long strings of fluvial villages. But these decayed with the expulsion of the Society of Jesus from the Americas, and the next large-scale excitement was not till the late nineteenth century when the boom in wild rubber brought the Indians back to the rivers and the subsequent ruthlessness of the exploiters drove them back again into the woods. From which, so far as we can see, they have not yet come out.

For those who were not born in it the climate of the Oriente is nothing short of death, and no outsider would live there without some overpowering motive. The Jesuits and the rubber gatherers, each in his own way, had this motive, but the South Americans of our day have not; so that what efforts have been made towards civilization have been carried out as a duty and not as a delight. Very few of the disputants have ever seen the Maynas General Command, and no one of them has seen it all. In this way discussion about it is built up on two rival traditions of map reading and not on any information at first hand.

If it were possible to sum up so old and involved a quarrel in a few words it might be said to amount to this: Ecuador maintains that the basis on which all the South American states were set up was the ancient Spanish Royal Audiencias which were universally accepted by law as the proper limits of the new states. Given the fact that South America chose to live on as a group of

sovereign states and not as one organic whole, then this inviolability of the colonial boundaries is the one principle which cannot be broken and the principle to which all others (such as that of "Uti Possedetis" which was also accepted by law) must be subjected. Furthermore, Ecuador points out, the ancient colonial boundaries cannot be affected by the last minute shuffles made by the old administration shortly before its death, shuffles made to meet conditions peculiar to the time and which can have no significance whatever in the general history of America.

Peru on her side opens her case by pointing out that she had already been a sovereign state for many years when Ecuador began. This came about because



The disputed territories of Tumbes, Jaen, and the Oriente

in the early days of the Independence Ecuador formed part of Grand Colombia, and it was only in 1830, after the death of Bolivar, that she started on her own. But previous to 1830, and under colour of a Spanish Royal Cedula of 1802 which had consigned these provinces to the Viceroyship of Peru, Peru had absorbed Tumbes, Jaen, and the Maynas General Command into her own constitution; so that when Ecuador was born they were already part of Peru. To dispute possession of them is tantamount to disputing Peru's right to her own constitution. This she cannot allow and will not even discuss. To her the boundary problem is not "to whom do Tumbes, Jaen, and Maynas belong?" but rather, given that they are Peruvian, "what are their proper boundaries with Ecuador?"

It can be said here and now that Ecuador's case is perfectly logical and

correct: its weakness lies in the fact that her precision does not go very well with the carelessness of South American politics, and that a hundred years of consistent unscrupulousness on the part of her neighbours can go a long way towards destroying primitive rights of the kind that she is claiming.

Peru, whatever may be the strength of her position in law, has only grown into it in the course of long years of patient possession. Now that her sovereignty over the greater part of what she claims is an accomplished fact, she can say that it was in effect hers since the beginning, but this was not what she told Bolivar in the first instance when she put in her claim against Colombia. In other words her case has developed from having been based on a set of doubtful premises (whose chief merit lay in the fact that the other side had no better) to its present flourishing state in which its base is the more solid one of continued possession.

As nations, Ecuador and Peru have very different characters. Ecuador is smaller than Peru, so it is natural for her to take up a position which would seem to involve all the other South American states on her side. Added to her smallness she has a bad flaw in that she is essentially made up of the two rival cities of Quito and Guayaquil who have never yet been able to see eye to eye with one another. This means that her natural state is one of revolution. Thus from 1830 to 1883 she had no less than ten different constitutions. Her civil wars, almost as reliable as a clock, made her a constant temptation to her neighbours; and in this way Colombia holds at least two of her northern provinces, Brazil has knocked off a small triangle of her far east, and it may well be that Peru has absorbed some of her territories on the south and south-east. Peru on her side is large. Her capital of Lima, having, in colonial times, been the seat of the Viceroy, it is not surprising that when she entered into her career as an independent state, she felt it to be her right to regain something of her old precedence. She became powerful, and seemed to be on the point of achieving this when in 1879 she fought a war with Chile and was almost completely destroyed. From that day to this she has been recovering. Peru is a strong character, with unity and cohesion in her parts, and who has been at war with the ideals and the sympathies of the past age. One more point which has to do with the present case: she has more easy access to the Oriente.

The Spanish dominion in the new world was in the first instance divided under two heads: the Viceroyships of Nueva España (Mexico) and Los Reyes (Lima). Under these Viceroyships lay the Royal Audiencias, of which there were four under New Spain and seven under Lima (Los Reyes), these last being the Royal Audiencias of Panama (created 1553), Lima (or Los Reyes) (1542), Santa Fé de Bogotá (1549), Charcas (1559), San Francisco de Quito (1563), Chile (1609), and Buenos Aires (1661).

But these Audiencias were not the same in quality. Those of Lima, Charcas, and Quito, as they lay close to the seat of the Viceroyship, were little more than judicial in character and were presided over by gowned judges. But those which lay farther afield from the capital had large military establishments as well as their court houses, were presided over by Captains-General, and, as the years went by, achieved virtual autonomy.

Thus, in 1717, it was decided to make Santa Fé de Bogotá into a third Viceroyship to include the Captaincy-General of Venezuela (which had hitherto been an apanage of New Spain) and the Audiencia of Quito. In the first instance this new arrangement was not a success: it was abolished six years later, to be finally re-established in 1739. Its Cedula of re-establishment, dated 1740, describes its southern boundary as follows: "From Tumbes on the Pacific seaboard the line follows the ridges and other cordilleras of the Andes across the Jurisdiction of Paita and Piura as far as the River Marañón which it meets at 6 degrees 30 minutes latitude South. To Peru falls the Jurisdiction of Piura, Cajamarca, Moyobamba, and Motilones. The line runs along the Cordillera of Jeveros and crosses the River Yavarí or Yauri at its point of confluence with the Carpí. The boundary follows the course of this last until it reaches the Solimoes or Amazon; this it follows as far as the westernmost mouth of the Caquetá or Yapurá, at which point begin the boundaries with Brazil."

It is on this description that Ecuador bases her claim.

From the days of the conquest the city of San Francisco de Quito had been celebrated for the great Jesuit missions into the Amazonas: Quito was their headquarters and from Quito came a great part of the men and the money. The journey down into the Oriente was incredibly difficult and the good Fathers stood a fair chance, before they got there, of having their heads cut off and reduced to the size of an orange. To prevent this, and to protect their establishments, they needed soldiery. Since, in the days before the new Viceroyship, Quito had few soldiers of her own, these were sent from Lima. But when the Council of the Indies allotted Quito to Santa Fé, no one had counted on the virtual impossibility of sending troops into the Oriente from Bogotá.

So from that day the odds turned against the Jesuits; one by one the townships on the Marañón, the Chinchipe, the Napo, and the Pastaza disappeared. The end came in 1776 with the decree which expelled the Society of Jesus from the Americas.

The weakening and the death of the Quiteno missions gave occasion for a drive into Spanish territory by the Portuguese. This excited the Council of the Indies and recourse was had to Don Francisco Requena, a most able man, who, for seventeen years, had been governor in the Oriente. He submitted his first report to the President of the Audiencia of Quito in 1776, and during the next quarter of a century we hear of him handing further reports to the authorities, the sixth and last of which is dated 1799. He must have lived to a great age and been possessed of great patience. His reports are interesting, both as they give a fair picture of the state of the Oriente in those years, and in that it was from them that the Council drew up the celebrated Cedula of 1802. He proposed three things: first, that in order to help the sending of men and supplies, the territory should be attached to the Viceroyship of Lima: second, that for the bettering of education the missions should be taken out of the hands of the various small bodies of priests and handed over to the Apostolic Missionaries of the College of Ocopa (Peru): finally, to gather up the ecclesiastical administration under one head, a new bishopric should be created in Maynas.

On 15 July 1802 the King published a cedula: "I have resolved that there shall be segregated from the Viceroyship of Santa Fé and from the Province of Quito and aggregated to that Viceroyship" (that of Peru) "the Gobierno and General Command of Maynas, with the towns of the Gobierno of Quijos, except the town of Papallacta, because all these are located on the borders of the Napo river or in its immediate environs. This general command shall extend, not only along the lower Marañón River as far as the frontiers of the Portuguese colonies, but also along all the other rivers emptying into the Marañón on its northern and southern banks, such as the Morona, Huallaga, Pastaza, Ucayalí, Napo, Yavarí, Putumayo, Yapurá, and other less considerable rivers, as far up in each as the point at which, because of its cataracts and inaccessible rapids, it ceases to be navigable. There shall also fall to the same General Command the towns of Lamas and Moyobamba, in order that, so far as possible, it may be coextensive with the ecclesiastical and military jurisdiction over those territories."

The fate of this cedula and the respect given to it are lost to us. Between the date of its signing and the time of the Independence there are confused reports of men struggling to enforce it, though whether with success we do not know. After the Independence trace of it is lost, and it is not brought forward as a witness till 1853 when the quarrel is already thirty years old. In Colombia its existence was known but no word was said of it publicly, perhaps because there seem to have been current hopes of its having been burnt when the Archives of the Viceroyship were sacked by the Revolutionaries. Peru certainly knew of it but equally said nothing, probably because express mention of it to Bolivar might have brought him to annul it.

Nor is the exact value of the cedula in law any more certain. The Ecuadoreans hold that it is no more than ecclesiastical and military: it specifies towns, lines of communication, areas of influence, but no word is said of territory: it was the custom of the Spanish Crown, when it ordered a change in territorial division, to say so more clearly; furthermore, there was a ruling in Spanish Colonial Law whereby a cedula did not become binding until it was carried out and proved a success: at the time when this cedula was due to be enforced the administration was in no state to do this, and in effect did not.

But the Peruvians maintain that the cedula implied complete sovereignty and that this sovereignty was in fact exercised. To prove what they say they hold documents, and seem constantly to be discovering more.

To put the strict value of the cedula in law on one side, the question turns on what was the importance of the Audiencia in the settlement of boundary disputes. It was in fact the most important unit of civilization in South America. Except in earliest times and except in matters of high policy, it was to the Presidents of the Audiencias and not to the Viceroys that the South Americans of those days would look. This is seen nowhere more clearly than at the Independence when the attempt to create the Viceroyships into sovereign states failed, and the people declared in no uncertain way that it was most natural to them to exist and grow up as independent and sovereign audiencias.

By the seventeenth century the Administration had fallen away from its

ancient effectiveness. The creation of the Viceroyship of Santa Fé was not a success: or if it was in some respects, it was not in so far as it included Quito. The same difficulties which Requena found to be so heavy in the Oriente also existed in the other parts of the Audiencia: there were violent complaints both in Jaen and in the Gobierno of Guayaquil against the hardship of travelling all the way to the High Court of Appeal in Bogotá when Lima was so much nearer. In all things it seemed natural and proper for Quito to run with Lima. In the days before the advancement of Santa Fé the clergy of the Diocese of Quito were subject to the Archbishop of Lima and the soldiers of the Audiencia were subject to the Captain-General of Peru. After the reversal of this by the handing of Quito to Santa Fé the entire Audiencia in all its parts, civil, military, ecclesiastical, seems to have fallen into decay. In Maynas and Guayaquil this decay became a scandal, and to repair it the Council of the Indies ordered the aggregation of the two provinces (Guayaquil Cedula 1803) to Lima. In the light of the subsequent fact of the establishment of the Audiencias as the nations of the independence, ought the muddle made by Spain on the eve of the total collapse of her authority be interpreted in such a way that Ecuador should stand deprived of two-thirds of her natural territory? One more consideration in favour of Ecuador's thesis: it is a historical fact that the Republic of Peru was no more the heir to the Viceroyship of Peru than was the Republic of Colombia in her final and definitive form heir to that of Santa Fé. In effect modern Peru is no more than heir to the Audiencia of Los Reyes, therefore she can hardly lay claim to lands by virtue of their having been subject to that viceroyship which happened to have its seat in her ancient capital. In other words a man who has been an engine driver and who has retired, cannot expect always to ride in the driver's cab.

But whatever the Cedula of 1802 may be worth, two facts are clear: first, it really existed, no one has seriously denied this; second, its existence has been Ecuador's misfortune, for whatever bearing it may have on the final settlement it has at least given Peru a good reason for occupying as much of the disputed territory as she could lay hands on.

In the year 1809 Ferdinand VII King of Spain was threatened with possible war at the hands of Napoleon. This gave occasion for the citizens of nearly all the capitals of Spanish America to approach their governors and to point out to them that, in the event of Spanish Colonial Policy being directed by the Usurper, their great loyalty to the Spanish Crown would force them to override any Edicts that might be forthcoming from Madrid, and, in Ferdinand's name, to take over the authority themselves.

The first city in the South to make this step was Quito herself. At daybreak on August 10 the President of Quito, Don Ruiz de Castillo, was woken up and handed this note: "The Supreme Junta to Count Ruiz, Ex-President of Quito: The Present state of uncertainty in which Spain is plunged, the entire annihilation of all legally constituted authority and the danger to which the person and possessions of our beloved Ferdinand are exposed, have determined our brothers of the Presidency to form Provisional Governments. . . ."

This was the beginning. The following year saw revolts in Buenos Aires, Santa Fé, Caracas, and La Plata. All were directed by juntas, all professed loyalty to Ferdinand, but all later withdrew this and proclaimed Independence in its place. The Spanish Authorities were stunned, perhaps deceived: but when the issue became more clear, they rallied: the juntas destroyed themselves with talking: that of Santa Fé, when in extremity, gave supreme power to Simon Bolivar (1815), bequeathing him therewith an impossible military situation. He was defeated, but returned, and in 1819, at Angostura, created the Republic of Venezuela. This new state was confirmed by the victory of Boyacá, and before the end of the year he proclaimed the Republic of Colombia.

Meanwhile, in the South, the Junta in Santiago de Chile had, in 1817, handed the command to General San Martin who, the following year, secured the independence of Chile and by 1820 was in a position to march northwards into the Viceroyship of Peru. This he did, and on 28 July 1821 he entered Lima and ordered the formation of a Peruvian National Congress. To this assembly he resigned his powers, he himself returning forthwith to Chile. But, as might have been expected, the newly formed parliament had so much to discuss that it had no time to prevent the recapture of Lima by the Spaniards. At this point word was sent to Santa Fé to ask help of Bolivar.

The Republican cause in the North had been going well. On 30 August 1821, at Rosario de Cúcuta, had been signed the Constitution of Grand Colombia, a state built up out of the Audiencias of Santa Fé, Venezuela, and, in anticipation, Quito. For this last had been in the hands of the Spaniards since 1812 when the revolt against Ruiz de Castillo came to an end. Marshal Sucre was sent in the name of Grand Colombia with orders to free Quito from Spain. This he achieved by the Battle of Pichincha, at the same time making it possible for Bolivar to answer the call of the Peruvians and to send armies south to Lima.

Bolivar himself entered Lima on 1 September 1823 and was at once vested with the full powers which had formerly been held by San Martin. The following year, by the Battle of Ayacucho, the Independence of South America was finally secured and Bolivar was free to turn to his favourite business of framing Constitutions. This he did astonishingly badly. The Audiencias of Charcas and Los Reyes were made into the Republics of Bolivia and Peru respectively. This would have been well had not each been set up with three houses of representatives all holding full freedom of speech and all governed by a president with full powers of suppressing that speech. So that when the time came for Bolivar to return to his own country (1826) he left everyone in the South perplexed and angry.

At first sight the Independence, with its many constitutions framed and broken and its two hundred battles, the whole taking place over a period of fifteen years, is hopeless confusion. But this is not really so. First it must be remembered that it is one historic act and not many, and that the sequence of happenings is of no particular significance. Thus the order in which the new nations emerge does not mean very much. The result was achieved by international characters such as Bolivar, Sucre, San Martin, Artigas, great men who belong equally to all South America; it means nothing that one

was a Venezuelan, one a Colombian, one a Chilean, and so forth; similarly it means nothing that Peru had to look both to Colombia and to Chile for her final freedom from Spain. This sense of equality among the states is attested by their agreeing to adopt the Colonial divisions and the principle of Uti Possedetis as the joint means of fixing new boundaries. South America accepted independence at the hands of the Liberators, but she did not accept their ideas. Hence their opinions in detail as to how the new states should be made, opinions which they gave very freely, do not count for much. This was all for the best because confusion reigned in the heads of those great men, a confusion which is perhaps best seen in the fact that they were all violently and sincerely devoted to the Cause of Liberty yet all felt themselves betrayed and abused if any man should dare to practice liberty against them.

To take the case of Bolivar, as being the man who most concerns us here, we see at once that he overlooked the Audiencia and only thought in terms of the Viceroyship. It was inconceivable to him that the three Audiencias of Venezuela, Colombia, and Quito could ever want to live other than in one devoted whole. By the same token it was to him disgusting and punishable self-will on the part of the Citizens of Guayaquil to choose to be an independent state. He coerced the three together and coerced Guayaquil to join with them. The Audiencias could hardly wait till his death before springing apart, but Guayaquil, in so far as it has remained with Quito rather than return to Lima, has consented to abide by his will. Thus his thoughts and opinions on the boundary question, though they are valuable in that they show what men believed at that time are not in any way binding, as they might well have been had the states consented to fulfil all his wishes and chosen him as their "father."

Bolivar had three separate difficulties in his Southern Boundary: there was Guayaquil, there was Jaen, and there was Maynas. In those days no one cared about the desert of Tumbes. In things to do with administration Bolivar was extremely practical and in all else highly sentimental. Guayaquil, the great port of the south, was necessary to his Empire therefore it must be his. But two considerations stood in his way: it had been handed over to the Viceroyship of Peru by a Royal Cedula of 1802, and the citizens themselves had declared for autonomy. In August of 1822 Bolivar went to Guayaquil in person. On his arrival he remarked, not without satisfaction, that the principle secessionists had sailed away with the Peruvian Fleet and that it would not be difficult to bring the remaining citizens to his point of view. This he did.

The Maynas General Command was immeasurably far away from the world as it then was, and this made it a proper object for sentiment. Bolivar knew of the existence of the Cedula of 1802 though it is not clear exactly what importance he attached to it. One thing that is certain is that he was not going to let it stand in the way of his commonplace "that Grand Colombia extended from the Orinoco to the Marañón." The Marañón cuts Maynas in two, therefore it seems that Bolivar intended to go shares in the matter of the cedula, keeping the left bank for Colombia and leaving the right bank to Peru.

Jaen, having no commercial importance and not figuring importantly on

the map, appealed neither to his head nor to his heart. So in the absence of strong feelings he seemed ready, if not to judge of it on its merits, at least to see the province lost to Colombia if thereby he could gain his other ends. Jaen had unquestionably been part of the Viceroyship of Santa Fé and of the Audiencia of Quito right to the end. But like the other provinces of the Audiencia it seems to have suffered from this. Jaen grew tobacco. The natural market for this was Lima, but before it could be sold there, customs had to be paid. This was so discouraging to the people of Jaen that in the course of the seventeenth century the population dwindled from thirty thousand to seven thousand. This state of affairs was set before the Spanish Governors who during their last half-century of office had been taking steps for the handing over of Jaen to Peru, though they had never quite achieved it. This was the reason why the local councils, at the time of Independence, were most anxious to belong to Peru.

Bolivar, when he heard of this, was at first indignant, but later seemed inclined to leave the matter for the time as being unimportant. He said nothing of it during the two years when he was Master of Peru and it was not until 1827, when he was once more Dictator of Colombia and was faced with a general revolt against his person in all the states of the south, that he declared his feelings in these terms: "If, six months from now, Peru has not placed the Province of Jaen and the lands of Maynas which she now holds, under the orders of the Intendent of Azuay (Ecuador) the Government of Colombia will declare a state of war with Peru and will persevere until the fortunes of arms have upheld the right. . . ."

But before the account is carried any further, something must be said of the state of Peru and Colombia themselves at this time, and of their relations with one another. It must be remembered that they were not nations in the sense that they are now. In themselves they were little more than gatherings of men; of soldiers who wanted honour and of men of affairs who wanted what is commonly called prosperity. Thus, when Jaen and Guayaquil voted, the one for union with Peru and the other for autonomy, it was their pockets that prompted them. Similarly, when General la Mar, the Peruvian President, marched north into Colombia, it was not because Peru had a quarrel with Colombia, but because he himself wanted to have a fight with Bolivar.

It is important to remember this, because both sides like to vest the acts of this period with a national significance which they certainly never had, thus making the whole problem so much more difficult to unravel. Another difficulty is to give the acts of this time their proper value in law. The Colombian Congress, sitting in Cùcuta had, in 1821, drawn up their constitution in which the boundary with Peru was named as "being coextensive with that of the Viceroyship of Santa Fé as it was previous to 1810." When the Peruvian Congressmen, two years later, came in their turn to draw up a constitution they named their frontier with Colombia in exactly the same terms. The trouble was that no one said if the Cedula of 1802 was held to be valid or not and both sides were apparently left to interpret the matter in their own way. It only became difficult when the writs had to be issued for the elections. In this Colombia had two years' start, but Peru, when she was called upon to

acknowledge Colombia's possession of the Oriente, wisely pointed out that she could take no account of Colombia's Constitution till she had ratified her own. But when, in 1823, she did this and forthwith issued writs calling the deputies in those provinces to come and sit with her, the trouble began. But since the struggle with Spain was still going forward there was no time to fall out on what was then still an academic issue, so both sides entered into an agreement (later to prove equally embarrassing to both) whereby those towns on the left bank of the Marañón were to vote with Colombia, and Jaen and those on the right bank with Peru. By this means both their constitutions were queered, because however natural a boundary the Marañón may be, it was certainly never the boundary between the Viceroyships, either if the Cedula of 1802 is taken into account or if it is not.

The upshot of all this is that, however interesting the legislative acts of this age may be in showing how the countries stood with one another, they cannot be given that absolute finality in law which is so often claimed for them. Peru, as we have seen, declines so much as to discuss her right to sovereignty over Jaen and Maynas on the ground that they were an integral part of herself from the time of her constitution in 1823. Though it is true that she claimed them at that date it is also true that her claim was at no point uncontested and her possession (at least of Maynas) was by no means accomplished.

In the same way the war which followed on Bolivar's Declaration is only interesting to us now in that it ended in the most confusing set of peace treaties that could be imagined. Like all the wars that followed in the train of the Independence, it was a civil war fought on a personal issue. It was part of the revolt against Bolivar which had been going forward since 1823 and which was to end, not with the Treaties, but with the death of Bolivar from consumption in the last days of 1829. The boundary question was certainly the nominal cause of the war, but it was not the real cause. For had it been the real cause, the parties, when they came to sign the peace, would not have been so willing to put off the settlement for another time.

The fighting itself began with the capture of Guayaquil by the Peruvian Navy. But this success was immediately offset by the total defeat of General La Mar at the hands of the faithful Marshal Sucre in the Battle of Portete de Tarqui. But a rebellion in Venezuela gave Sucre no time to dislodge the Peruvians from Guayaquil and he decided to sign a truce on the field. This was followed by a treaty at Guayaquil by the terms of which the Peruvians left Colombian soil and both parties consented to discuss the territorial question in Lima.

The Case now reaches its most anxious phase. On 25 November 1829, General Don Tomas De Mosquera, the Colombian Plenipotentiary, arrived in Lima with the declared object of carrying out the terms of the Treaty of Guayaquil. Up to this time there can be no doubt that the prevailing opinions in Peru as to what was the right settlement were, except for Jaen, the same as Bolivar's. We have a note written by Don Jose Larrea, the Peruvian who signed the treaty in Guayaquil, in which he wrote to his Government saying that:

"In order in the Future definitely to avoid controversies of every description with that Republic" (meaning Grand Colombia) "it would be most suitable and convenient to fix as the boundaries of the two states the mouth of the Tumbes river" (that is, leaving Tumbes to Colombia) "with a line running parallel through the Environs of Loja to the source of the Chinchipe river" (leaving Jaen to Peru) "the waters of which are confluent with the Marañón and enclose our territory in that section." (Maynas to be divided, the greater part to Colombia.)

Further to this we have the evidence of an official Peruvian map, dated 1826, which follows much the same lines. It must be remembered that in spite of the tone of Bolivar's declaration of war, the question was not at this time an angry one and there can be no doubt that had the Liberator lived another six months the boundary would have been fixed once and for all in this sense.

But Bolivar was known to be ill and Grand Colombia was known to be in a precarious state, and the Peruvian Foreign Office must have thought that there was nothing to lose and that there might be much to gain if the settlement were delayed. Besides, there was trouble with Mosquera over Jaen, and this, together with the fact that the frontier had never been officially surveyed (that is, under the terms of the Treaty: Peru had made her own survey, witness the map of 1826) was enough for the Peruvian Foreign Minister to withhold his signature so long as it suited him. There is no charge of bad faith in this: any Foreign Minister would have done the same.

A certain Colonel Althaus was commissioned to make a map, and meanwhile Mosquera was properly fed and kept amused by discussions about Jaen. In December he wrote to Bolivar: "We have already decided on the Rivers Tumbes, Marañón, and Macará. Nothing remains but to think about the Chinchipe." (That is, Jaen.)

But it was too late. On November 4 Venezuela declared her secession from the Union; on December 17 Bolivar, who *was* the Union, died; on Christmas Eve General Paez opened the Venezuelan Congress in Caracas; in January the Constituent Congress of Grand Colombia, which had been convoked by Bolivar two years earlier but never summoned, met in Bogotá in the vain hope of drawing Venezuela back into the Union: by the end of April all thought of this was given up, and in May the three southern provinces of the Union, Quito, Guayaquil, and Azuay, banded themselves together into a new state which they called Ecuador.

Mosquera did not leave Lima at once. Grand Colombia's international personality was not yet thought to be dead and there were still hopes that she would live on in some Federal existence, hopes which were not formally stopped till 1835. But by July Mosquera seems to have become restless and anxious to return to Colombia. On the 24th of that month he appears to have sent a note to the Peruvian Foreign Minister in which he resigned his charge and told of his coming departure. On the 31st he asked to be allowed to send his baggage on board the Colombian war schooner *Guayaquilena*; on August 2 the Marine Commander of Callao acknowledged orders to go forward with his embarkation. A week later (according to the *Mercurio Peruano*) he embarked, and on the 10th the *Guayaquilena* weighed anchor.

Now, on August 2 the post of Foreign Minister had been handed to a certain Don Carlos Pedemonte.

The importance of all this is that the Colombians hold a protocol, signed by Pedemonte and Mosquera, in which the frontier, except for the part round Jaen, is carefully laid down. This protocol bears the date August 11. That is, the day after Mosquera sailed from Callao. The Colombians did not so much as mention the Protocol before the year 1892, and they did not impart the thing to Ecuador till 1904. But from that date it had figured very large in the Ecuadorean case, probably to its prejudice. The Peruvians call it a forgery and show the details of Mosquera's embarkation to prove it; furthermore, they point out that even if it were not, Mosquera by that date had ceased to represent Grand Colombia, and Grand Colombia herself, in view of the previous secession of Venezuela, had ceased to exist.

The position of Ecuador is very delicate. She accepted the document on trust from Colombia assuming that Colombia could, and if need be, would show that it was true and valid. This Colombia has not done. Ecuador has always been at a disadvantage in all matters which have to do with the years before 1830, since the archives both of the Viceroyship of Santa Fé and of the Republic of Grand Colombia are in Bogotá and Ecuador's access to them depends on her relations with contemporary Colombia which have not always been of the best.

In effect the Pedemonte Mosquera Protocol is by no means essential to her case. Even if all that is claimed of it could be proved, it could do no more than give evidence for an intention on the part of Peru, and this intention is clearly established by other proofs. If it is clear on the one hand that Mosquera did not set his hand to any boundary arrangement binding on Peru, it is equally clear that his mission was a success in that it had the effect of showing what Peru thought and hoped for at that time, of showing that she was ready to give up Tumbes, that she was determined at all cost to hold on to Jaen, and that she was prepared to consent to an unfavourable division of Maynas, taking the Marañón as a boundary. And this is enough to upset the Peruvian contention "that Tumbes, Jaen, and Maynas were an integral part of Peru since the time of her Constitution in 1823."

On 23 September 1830 the Constitution of the new Republic of Ecuador was signed. Thereby a new problem: "was Ecuador heir to whatever rights Grand Colombia may have held against Peru in the matter of the Southern Boundary?" Peru said she was not.

The question turns on the way South American frontiers are made. That is, if they are drawn according to strict right, then, because Peru could hardly acquire new rights merely because Grand Colombia split into three, Ecuador is indeed true heir to Grand Colombia in this. But if the boundaries are arrived at by bargaining, then, because Peru could hardly be expected to credit Ecuador with the bargaining power formerly held by Grand Colombia, Ecuador is not the true heir.

In effect the South American frontiers are made by both ways of reckoning: they usually begin by an examination of the rights and end by some sort of bargaining. Thus Ecuador could not lose any of the rights that Colombia

held before her; if Grand Colombia had the right to claim Tumbes, Jaen, and Maynas, then Ecuador had the same right to go on claiming them. What she had not got was the power of enforcing whatever right she may have had, and this, over a long period of years might, if she were careless, run her in danger of losing some part or all of the rights that she held in the first place. At the time when Ecuador was born, Peru, rightly or wrongly, was sitting in some of the lands she considered to be hers. Either Ecuador could drive her out or she could keep up a regular system of protests until such time as there was a strong enough international authority to do it for her. She tried both.

Peru, not unnaturally, was delighted to see Grand Colombia break up, and she was quick to acknowledge the three separate parts that came out of her. So that when Don Diego Novoa, the first Ecuadorean Ambassador in Lima, came in September 1831 to present his credentials, he found the faces of the members of the Peruvian Cabinet wreathed in smiles, and the President expressed "the intense satisfaction he felt in recognizing the envoy who first made heard in the Republic of Peru the voice of Ecuador. . . ." But as there were still doubts as to whether or not Grand Colombia might still be revived it was not till June 1832 that Peru entered into a "Treaty of Amity and Alliance" with Ecuador. In this treaty it was remarked that "while negociating a convention for the adjustment of boundaries between the two states, the present boundaries should be recognized."

Nothing signal happened till 1840, when Ecuador, suspicious of the long quiet, set up a demand that the boundaries should be fixed. The Peruvians, in a curt note, asked "what was meant?" adding that both nations were enjoying peace and that it would be folly to ruffle it. Ecuador replied saying that it was high time the Treaty of Guayaquil were accomplished. Peru at once denied the treaty to be in force: so far as she was concerned that of 1832 only was valid.

But Ecuador at that time was in the hands of the masterful General Flores, who at once ordered the matter to be taken up. A set of conferences were arranged to take place between Doctor Matias Leon and the General's Foreign Minister, Don Jose Felix Valdivieso. Flores took a strong personal interest in the proceedings and kept walking into the conference room to see how things were getting on. On one occasion he brought De Marten's book on International Justice and pointed out to Leon the passage which attested the validity of treaties like that of Guayaquil, and on another he called in the Colombian Minister who also had an affair to settle with Peru over her non-payment of the costs of calling in Bolivar's Army in 1821. Finally Flores declared that if Leon did not give satisfaction before a certain date, Ecuador would occupy the territories that belonged to her. At this point Leon put an end to an unpleasant visit and asked for his papers.

But Flores was having too much trouble with Colombia to carry out his threat, so the following year he sent General Daste to Lima to try and pick up the stitch which somehow or other had been dropped. But the Peruvians would not say anything until the honour of Doctor Leon had been salved, and since the General could not find it in himself to do this the discussion came to an end almost as soon as it began. Then followed eleven years of silence.

In 1853 a new generation of diplomats took the matter up. On March 10 of that year the Peruvians set up a political and military government in Loreto (Maynas) and they quoted the Royal Cedula of 1802 together with the Uti Possedetis of 1810 in support of what they were doing. This must have been an unpleasant surprise for the Ecuadorians who, as there was no continuity between their Foreign Office and that of Grand Colombia, had never heard of the Cedula before.

Ecuador was impressed, but answered by bringing up a bill in her Congress which dealt with the Freedom of Navigation in the Amazon Rivers, each of which she took care to specify. To this Peru made her protest in due form, and nothing more was said or done by either side till 1857, when Ecuador struck on the plan of clearing her foreign debts by making over " One million quarter sections in the Canton of Canelos in the Oriente on the Banks of the Bobonaza River, reckoned from the point of confluence of that river with the Pastaza towards the West at four reales" (that is, ten cents gold) "per quarter section" to some British bondholders who knew nothing of how controversial their tenure would have been. The move was not a success. Peru demanded the retraction of the deal (though by some oversight of her Foreign Office she cited the Treaty of 1829 the validity of which she had already spent so many years in denying), the United States and Great Britain hurriedly withdrew their countenance from the transaction, and the following year Peru declared war and sent her navy once more to take Guayaquil.

Ecuador meanwhile had been thrown into several revolutions, so that when the Peruvian squadron sailed into the Guayas river the Ecuadoreans were too busy among themselves to take any notice. After eighteen months of embarrassment the Peruvian commander caught the attention of one of the Ecuadorean leaders and signed with him the Treaty of Mapacingue (1860) whereby Ecuador should be allowed two years in which to establish sovereignty over Quijos and Canelos. But the Peruvians had picked on the wrong man, and on his defeat, the Central Government declared his acts to be void, and so that there should be no misunderstanding, published an extremely comprehensive Territorial Law in which the full claim was maintained.

Then followed twenty-six years of comparative quiet and great politeness. There were many notes exchanged during this time, usually concerned with Peru's plans for the colonization of the Oriente. But on Peru's side at least there is a change. There is no longer talk of strict right. Instead there is a suggestion that Peru will occupy all that is useful to her and that she will leave what remains to Ecuador. On the one hand she shows more real interest in the Oriente, sending expedition after expedition into the forests, and on the other, she seems more inclined to recognize Ecuador as an Amazon Power, which she could not be if Peru claimed all the Amazon lands. In a note directed to Quito she talked largely of Ecuador's "rich Amazon Heritage," and when she came to draw up a fluvial treaty with Brazil she gave Ecuador's name as being numbered among the interested countries.

From 1879, for six years, Peru was destroyed by war: war, first with Chile, in which her character of a sovereign state was all but blotted out, then war

with herself in which her organization was reduced almost to nothing. Though Chile suggested, again and again, that Ecuador should invade Peru from the north and take from her all that she could lay claim to, Ecuador had the good sense to refuse.

But in 1886, when the wars were over and Peru was at last in the hands of the stable and sensible President Pierola, Ecuador felt it was time to stir, and she prepared to revive her plan of paying off the bondholders with lands on the Bobonaza river. This, being a very old idea, was followed by a very new one. On 1 August 1887 was signed the Espinoza Bonifaz Arbitration Convention, whereby the whole matter was to be put to the King of Spain, who was to judge of it as of strict right, the convenience of neither side to be considered in the least degree. Nevertheless, if they were of a mind to reach a settlement before the award, they were free to do so. Alfonso XIII being only fifteen months old the thankless and unprofitable job was accepted for him by his mother, and the two parties set to writing their briefs. That of Peru ran to twelve volumes.

Both parties seemed alarmed at the prospect of the award. Ecuador was shy from the start, partly because she was afraid that it ran contrary to the terms of the Treaty of 1829 which said nothing of settlement by arbitration, partly because she knew that most of her evidence lay in the archives of Colombia from whence it was not always easy to extract it. But she resigned herself to her fate; and her brief, after it had been lost in the train journey between Paris and Madrid, was found again and duly handed in. Peru on her side seemed no less apprehensive. Above all she feared the loss of Jaen, which, though small, was at least inhabited by real Peruvians (as opposed to the potential Peruvians who lived in the Oriente), and seemed immeasurably more precious than many thousands of square miles of black forests.

Both cases were presented in their most exaggerated forms. The good men of both sides were shocked to see the huge difference between the claims, differences which looked bald on the map. The Peruvian Chancellor, Elmore, had heart searchings, and wrote saying that "the youthful secretary entrusted provisionally with our Legation in Spain has in a fit of patriotic fervour exceeded his instructions and has put in an exaggerated claim . . ." The Ecuadoreans on their side held to the letter of the Cedula of 1740, and drew their line at lat. 6° 30′.

But there seemed real danger that, whatever the award, both sides would be the loser and that a war would follow. So the parties agreed to do their best to avert this, and Doctor Arturo Garcia and Don Pablo Herrera met in Quito at the end of 1889 to see if they could settle the limits among themselves. They nearly succeeded. The arrangement they lighted on was that Peru should hold Tumbes, Jaen, and the parts of Maynas where she held establishments. Thus Ecuador was left with the zones of the Maynas General Command which lay close to her, Macas and Quijos, and also the northern strip next the Colombian frontier which usually goes by the name of the Sucumbios Missions and which encloses Canelos. In this way Ecuador had one of the navigable Amazon tributaries, the Putumayo, nearly to its full length, and a usable part of another, the Napo. Both Congresses ratified the compromise, the Peruvian conditionally upon an alteration being made in

the area of the Morona river. But this the Ecuadorean Congress would not countenance, and both withdrew their ratifications. To-day, when she looks back to this time, Peru shudders to think how near she was to signing away part of her birthright.

Four years passed. In 1894 it was suggested that Colombia should enter the arbitration and that all three should settle their differences in Madrid. This Ecuador refused, feeling that the other two would undergo irresistible temptations to settle theirs by dividing the Oriente between them.

Ten more years passed. The new century had started badly with two small battles at Angotera and Torres Causano, fought in the depths of the forests between pickets. But by October 1904 excitement had cooled enough for both parties to subscribe to a return to arbitration. The King of Spain was asked to appoint a commissioner who should make a report and set the business of the award once more on its feet. This delicate mission was entrusted to Don Ramon Menendez Pidal, who arrived in Quito in the spring of 1905, cleared the Oriente of troops, and in April returned to Spain, giving it to be understood that the award would be forthcoming within six months.

The procedure was that the evidence should be put before a council of State, this council should give its findings to the King, and the King should give the award. But by this time the whole question had grown to be very fierce: Peru, in her final memorial, made it very clear that if Tumbes, Jaen, and Maynas were taken from her she would feel herself at liberty to take them back; Ecuador felt the same, but preferred to wait for an unfavourable decision before saying it.

The council sat for three years. Towards the end of that time it transpired that though the councillors were by no means unanimous, they were arriving at a line which, though at first sight it looked very like the Garcia–Herrera, in effect cut off Ecuador from the navigable parts of all the rivers. This was more than she could bear, and in 1910 she withdrew from the award. This did not sound gratefully in Lima, and war was only prevented by the United States, Argentine, and Brazilian Ministers, who pointed out that it would be "Unamerican" to fight about a cause which was still up for arbitration. Meanwhile the Chilean Minister in Quito persuaded the Ecuadorean Foreign Minister that, if Ecuador could not let the award go forward, she must at least stand by it until the arbitrator himself withdrew, and this in effect happened in November of 1910.

The breakdown of the Spanish arbitration brought the parties to that absurd point common to most of the international disputes of our time in which they could only keep on terms by agreeing not to discuss the one point that interested them most. So they could do nothing but go forward in silence with their modest establishments in the Oriente, though Ecuador suffered from the embarrassing circumstance that she could only send food to hers by way of the Amazon port of Iquitos, which was firmly held by Peru.

In 1916 a curious thing happened. Ecuador made over part of the Sucumbios Missions to Colombia. Why she did this it is hard to see. Since the Missions formed part of the full Peruvian claim it may have been with the object of involving Colombia in her cause; but if that was so, she was

sadly disappointed, for in 1922 Colombia made over those very lands to Peru. Ecuador, who now saw herself shut in on two sides by Peruvian soil, not unreasonably felt herself to be the victim of a conspiracy, and broke off relations with Colombia.

But she consented to enter into yet one more arbitration with Peru, and this was embodied in the Ponce Castro Treaty of 1924. There are two sorts of arbitration: either it can be of strict right in which legal titles are the only evidence, or it can be of equity, in which every possible consideration can count towards the decision. The Spanish arbitration had been of the first sort. Had the award been given, it would have begun with a declaration of what were the rights and would then have gone on to interpret them. Thus Articles 13 and 14 of the recommendations which the Council was on the point of handing to the King read as follows: "Considering: from the principles laid down and the facts proved it follows that the Provinces of Jaen and Maynas (to-day the Departments of Amazonas and Loreto) belong to Peru, under whose sovereignty they were when in 1832 Ecuador was finally constituted as a state. . . . From this it follows that the question is reduced to the determination of the extension and limits of Jaen and the ancient Province of Maynas in so far as these lie adjacent to Ecuador."

Without favouring Ecuador it can be said that this was neither fair nor sensible. Not that the result was necessarily wrong, but only the way in which it was reached. The terms of the arbitration had put the Council in a false position. It was not possible to draw valid titles from the scrimmage that happened in South America between the years 1809 and 1832. True it was possible to reach a result, but not one in which men could have confidence; and confidence is essential to arbitration. The acknowledged uncertainty of later cedulas and the confusion of the Independence forced the Council to take hold of the one solid fact of Peru's prior birth, and on this they pinned everything. Ecuador's fault was not that she broke away from the arbitration (that was a virtue) but that she indulged in it for so long.

The difficulties that had to be met by the new treaty were these: on the one hand the case in its nature did not lend itself to settlement by strict right, and on the other the arbitration of right had gone so far that Peru could hardly be expected to forgo everything that she was on the point of gaining by it. The result was one of those international documents in which both parties are treated to the illusion that they have done well. The Ponce Castro Treaty promulgated the "mixed formula" whereby the parties were to agree as far as they could among themselves, then, when they got to a dead end they were to agree as to what they were going to submit to the arbitrator, who in this case was the President of the United States. It will be seen at at once that arrangements of this sort presuppose a miraculous concord between both sides. For the arbitration cannot take place until both sides are agreed as to what it is to be about. In view of the upsetting experience of the Spanish Arbitration, neither is likely to agree to this until it has got the bulk of what it wants. Thus the arbitration is only likely to be concerned with some comparatively indifferent matter like the actual marking out of the frontiers: the allotting of the territories can only be done in the discussions. These began in 1934 in Lima, they were interrupted by a small war in

Tumbes and then transferred to Washington in 1936 when President Roosevelt, putting off an election tour to supply the confidence that was missing, attended the opening session. More to show that they were trying than to reach any specified result, the delegates consented once more to toy with the mixed formula: Peru gave up all claim to any of the lands west of Jaen and Maynas, and Ecuador to all east of these. Beyond that neither will go. In 1938 the Washington Conferences came to an end, and the bad relations which the two countries have kept up ever since bring the account of the dispute up to to-day.

Nothing is more easy than to be brusque with other peoples difficulties. Here are two parties who have had a clear hundred years in which to settle up; and now, with the world all round them in a turmoil and with America anxious for her unity, they still cannot set their hands to an agreement.

The reason surely is that the Spanish American does not take that delight in compromise which is part and parcel of the North American. The Saxon, by a curious indifference of spirit, is quite happy to live through his life with his honour and faith so compromised that their very existence is in doubt. The Spaniard would never do this. He has not got the faculty or defect of indifference.

Peru has an excellent case and one which it might be sin to drop, and so has Ecuador. Respect for the wishes of the United States has prevented them from fighting on the issue; and since they have to this extent made a sacrifice to the United States of their instincts, some responsibility for the result must have been shifted from them to her.

Faced with questions of principle the United States is of two minds: she is anxious that the oppressed man should retain his rights and also that the vigorous man should not be unduly thwarted. Called upon, at any moment in time, to judge between the two she will usually say that what has been done cannot be undone, but that for the future she will apply shackles and pulleys. Perhaps this is what she would like to do in the present case; but if so, the litigants are not pleased and will not (as yet) comply.

Given that the Royal Audiencias were indeed the origins of the new States (and when we remember that the exceptions to this rule, Uruguay and Paraguay, came about because the Spanish Organization in the east was still undeveloped at the time of Independence, it is very hard to deny this) then the democratic thesis must maintain that they are inviolable, that Ecuador has been oppressed, and that not only Jaen and Maynas, but also Pasto (Colombia) must be restored to her.

But if the democratic thesis is not to be held to the letter and if the claims of more effective organization are to be allowed to creep in on it, then it is Peru who is able and willing to develop the Oriente, and it is to her that it should belong.

Tumbes is now in the hands of a technical commission that is trying to decide if and by how much the river Zarumilla has changed its course. Jaen, in view of the fact that it still grows tobacco and still finds it most natural to sell it in Lima, will turn towards Peru. We are left with the Oriente.

If we admit that the historical question of the Oriente is so tied up that it

is neither possible nor useful to try and untie it and that the political question is too momentous to bear discussion, there always remains the geographical. And it is quite likely that the geography will be decisive.

There are two obvious considerations: the eternal difficulty of reaching the Oriente from Ecuador, and, given the fact of Ecuador's sovereign existence, the unfairness of cutting her off for ever from the Amazon basin. But there is a third geographical consideration and one which is not seen on the map: the climate of Ecuador at once gives her everything she needs and discourages her from outside undertakings. It is unlikely that she would ever want to turn very seriously to the Oriente.

Then there is the question of existing communications. Now that airplanes are being used both sides can claim that many points are connected with the capital. This is true in so far as posts and medicine are concerned, but no country can be developed by air alone. It takes a fortnight to a month for heavy traffic to reach the Maynas General Command, either by mule and boats, or by ship half round South America and up the Amazon. But Peru has reduced this by building a road from Lima to the headwaters of the Ucayalí at a point which can be reached by ships of 3000 tons register, and in this way Iquitos, the one town in the whole Command, can be reached in five days from Lima. Further to this another road is being built to Yurimaguas on the Huallaga, and these two should put Peru in a position to restore the Command to the state of civilization that it was in under the Jesuit Fathers in the seventeenth century.

When it comes to the drawing of the line itself, Ecuador prefers that it should follow the course of the rivers, if not the Marañón, then the Pastaza and the Putumayo; but Peru, that is intent on keeping Ecuador out of the whole system, calls for a line which runs through the headwaters of all the rivers at the point where they cease to be navigable. In general, a watershed makes a better boundary than a river, but in land like the Oriente, which is flat and thick with trees, there are probably no watersheds, and if there were they would be impossible to mark. Since water is only too common and no one is likely to want to make dams or do irrigation, and since a boundary you can see is always better than one which you cannot, perhaps Ecuador's suggestion is the best. The point is one for a technical commission, and until it has been decided the American Continent must wait for her share of the rubber and the timber and the oil that lies buried in those provinces.

RECONSTRUCTION AND DEVELOPMENT IN EASTERN POLAND, 1930–39

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Meeting of the Society, 3 November 1941

THE years of my title have been chosen as the first and last of a series of visits to Poland. I write of the country as I saw it in those years and often use the present tense where the past would now unhappily be more appropriate. The statistics throughout the paper are from the 'Concise statistical year book of Poland, 1937.' Except where otherwise stated, population data are for 1931 and crop data for averages of 1932–36.

It has been Poland's tragedy to have no natural boundary either to the east or to the west but only to the north and the south; in consequence during its long and eventful history there have been expansions and contractions eastwards and westwards like the movements of a concertina. Certain boundaries became definite after 1923, and had Poland been left in peace these could have become quite effective. The eastern regions fall into that remarkable strip of Europe, lying between longitudes 22° and 28° E., only as wide as from London to Holyhead, into which the surging movements of peoples from east and from west have compacted more nations than in any equal belt in the world; seventeen principal races and a host of minor ones are found along a stretch no longer than the return journey from London to the Shetlands.

Of the several nationalities in these eastern regions of Poland the most important are the Ruthenians, the Jews, the Germans, and the Lithuanians. The Ruthenians inhabit a belt of country running north and south along the Polish border and they are divided between Poland, Russia, Czechoslovakia, and Romania. There are several groups which have little if anything in common: the White Ruthenians of the north; the Polesians; the Red Ruthenians of Wołyń and Galicia; the Huculs of the Carpathians. In the main the White Ruthenians are Greek Orthodox while the Poles are Roman Catholics; their upper classes always freely intermarried with the Poles but the peasants remained more distinct. The Red Ruthenians are Greek Catholics. In recent years a political division has appeared chiefly among them: the Ukrainians, who are aiming at an independent Ruthenian nation. The idea of independence for the Ukraine was severely repressed in Russia, but the Poles admit the right of free national development and fostered Ruthenian schools and co-operative societies. Political troubles arose in the south between 1920 and 1935, when there were political assassinations, but I heard nothing of them in the northern regions. It is absolutely impossible to draw any frontier on purely ethnographical lines; indeed until recently the peasants did not classify themselves on national lines, but by their religions. The population is of similar structure throughout: in the towns Poles and Jews preponderate; in the country, Poles and one of the Ruthenian groups, but very few Jews. In Tsarist times this had been the region of large estates; the landowners were mainly Poles and the Ruthenians were mainly small farmers

and peasants. Under the Polish Government these large estates were being broken up, but some, like the Radziwiłł estate, chiefly forests, survived.

Geographically these eastern regions fall into four well-defined areas: the high ground (300–500 m.) of Podole in the south; the lower ground (100–200 m.) of Wołyń farther north; the still lower ground (below 100 m.) of Polesie in the centre; and beyond that the higher ground of the Nowogródek and Wilno regions.

Polesie

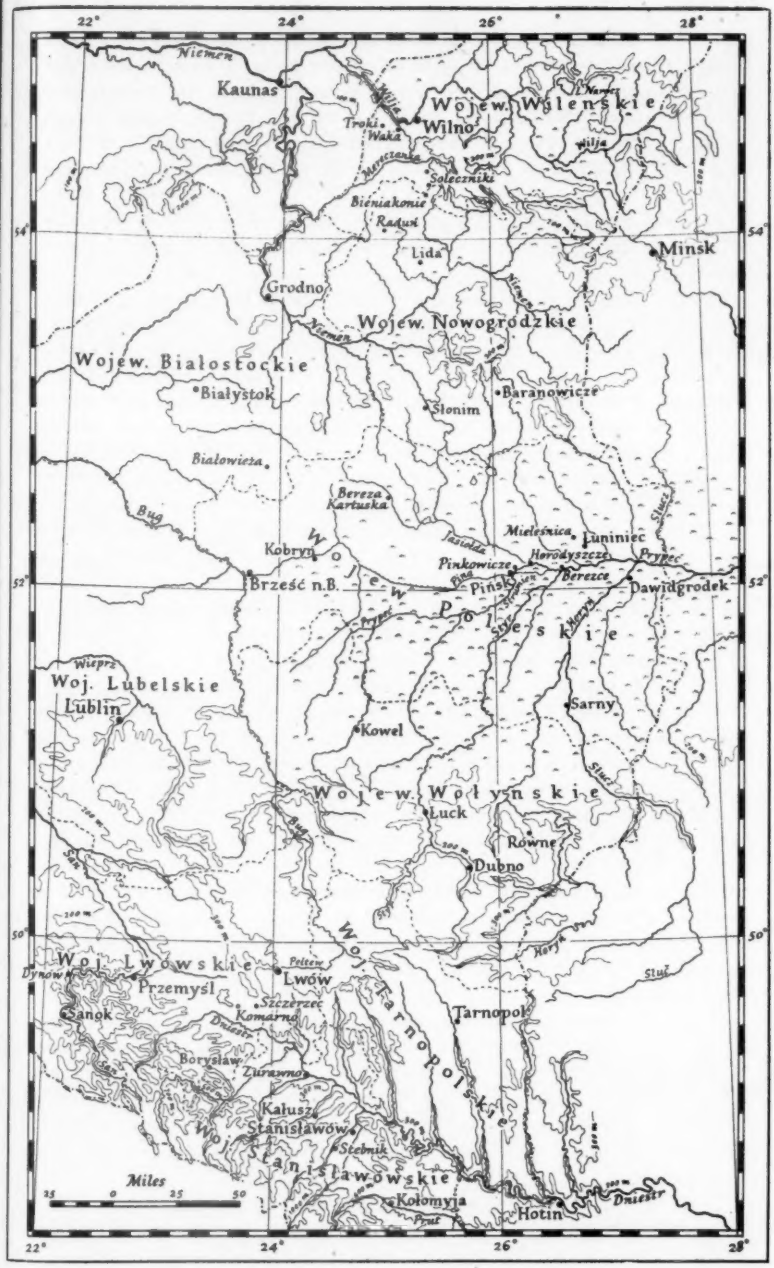
Polesie comprises the Pripet marshes, a huge oval basin lying east and west along the centre of which runs the river Prypeć. Only part is in Poland; the rest stretches into Russia as far as the Dnieper into which the Prypeć empties; a southern extension goes almost to Kiev nearly 400 miles down stream. The Polish part is only about 100 metres above sea-level, and the river has still 900 miles to flow before it reaches the sea, so that the fall is extremely slight. The rainfall is low, averaging at Sarny 560 mm., and the summers are hotter and drier, and the winters cooler and more severe, than is usual in Poland.

The most numerous and important of the tributaries of the Prypeć come in from the south and would naturally have gone to the Baltic. But in Polesie their way was blocked by the ice and dunes of the glacial period, and so they formed the Prypeć and found a way out eastwards. The watersheds that divide the Prypeć system from the Bug and the Niemen are very low and ill defined, so that these river systems trespass a good deal on the Prypeć, and the trespassing varies with the seasons and the human activities. The very slow flow leads to short circuiting between one branch of the river and another: the anastomosis of the physiographers. Flood time is March and April, and low water is in September and October. Stanislaw Pawłowski gives an admirable description of the geography of the marsh region in Congrès Internat. de Géographie, Varsovie, 1934: Excursion Polésie et Białowieża.

The marsh forms a vast plain at three slightly different levels. Along the river are the mud flats, chiefly mineral matter brought by the river; just beyond and slightly higher is the peat which forms a layer 3–6 m. thick; this forms by far the largest part of the marsh, and as the water is well charged with mineral water and the substratum is often chalk the vegetation has been of the mineral peat type, giving rise to "low moor" peat like that of our fens, and well suited to cultivation when drained. At a higher level is the acid peat more suitable for fuel and industrial use.

The plain is broken by sand dunes which are older than the peat, and play a very important part in the life of the country as they are the only parts not waterlogged and liable to flooding. Dunes are more extensive here than anywhere else in Poland or indeed in Europe. They are up to 20 m. in height, and form ramparts which may be as much as 5 km. long; the east slope is scarped, the west is gentle. They are or were covered by trees; after these are removed the soil can be cultivated for a time but it then loses its humus and becomes a blowing sand.

About one-third of the province is forest. In the northern part pine and fir predominate; in the south there are more deciduous trees: oak, ash, and


22°
24°
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Niemen
Kaunas
Wilno
Troki
Waka
Wojew. Wileńskie
Narocz
Wilja
Solecznicki
Bieniakonie
Radun
Lida
Minsk
Grodno
Wojew. Nowogródzkie
Wojew. Białostockie
Białystok
Słonim
Baranowicze
Białowieża
Bereza Kartuska
Bug
Kobryń
Wołyńskie
Mielesznica
Luniniec
Horodyszcze
Pinkowicze
Prypec
Brześć n.B.
Pińsk
Dawidgrodek
Polskie
Wieprz
Woj. Lubelskie
Lublin
Kowel
Sarny
Wojew. Wołyńskie
Luck
Równe
Dubno
Woj. Lwowskie
Przemyśl
Lwów
Tarnopol
Sanok
Szczerzec
Komarno
Borysław
Żurawno
Kałusz
Stanisławów
Stebnik
Woj. Stanisławowskie
Kołomyja
Hotin
Miles
25 0 25 50

alder. The fauna is varied; it includes wolves, bears, deer, and even elk; by the water there are beavers. It is the forest that gives the name to the region: Polissya, as the natives call it, in Polish Polesie, means "the country along the forest" (*las*). The name has nothing to do with Poland, which probably means the plain dweller, from Pole, plain, or in modern usage, a cultivated field. I am indebted to Professor E. H. Minns for information on these points.

The lakes are very characteristic features; there are more than four hundred having an area larger than 1 km^2., although they have little economic importance.

Polesie has been inhabited since very early times by a group of what are now the Ruthenians, but the special environment and the isolation have given them an entirely distinctive character and they recognize no affinities with any other people. They call themselves Polesuni; the Poles call them Poleszuki. They belong to the Greek Orthodox Church, and they average 70% of the rural population; the Poles, including the estate owners, average about 12% and in some districts fall below 10%; they are Catholic. But the population is sparse; Polesie occupies some 10% of the total area of Poland, but it had only 1·13 million people in 1931, 3% of the total population.

The towns have only 13% of the population and it is much more mixed than in the country; about half are Jews, this being a higher proportion than in any other province except Wołyń; 30% are Poles, the rest are Polesians with a sprinkling of Ruthenians and Russians. The largest town is Brześć, on the Bug (Brest Litovsk), the administrative centre; it had a population of 50,700 in 1931, but was rapidly growing.

The centre of life and culture for the marshes is Pińsk (32,000 in 1931), built on a spur called Zakorodzia, where the ways from Wołyń, the Vistula, and the Niemen all meet. It is an ancient city dominated by the seventeenth-century cathedral and monastery associated with the Jesuit missionary Andrzej Bobola, who was put to death by Cossacks and whose relics, after many vicissitudes, were returned to Poland with much ceremony in 1938. It is claimed that a synagogue has been here since the ninth century. As they were built mainly of wood few old buildings have survived, nothing comparable in interest with the towns in or near the Vistula such as Toruń or Chełmo. The main street is cobbled, the shops and houses small, but the large market-place is very interesting on market days, when it is thronged by peasants bringing in their wares: farm produce, hay, and some pottery.

Pińsk is an important collecting and distributing centre: the region exports timber and timber products, meat, fish, geese, mushrooms, and many minor foods, and it imports wheat, rye, and tobacco, mainly from the central and western regions. There are a match factory, timber yards, and two wood factories: it is claimed that plywood was invented here. As usual in Poland the commerce was largely in the hands of the Jews, who never seem to miss an opportunity.

There are no good roads and travel is mostly by water or on foot along paths that often follow the tops of the sand-dunes, or on cart-tracks running along the base where the moisture binds the sand and makes it firmer. A

Pińsk: main street

Pińsk: market for peasant produce

Hay from reclaimed land, Pripet marshes

Ruthenian cottage, Dniestr valley

Cottage of old style, Berezce, Pińsk marshes

motor car is of little service as the roads, mostly earth tracks, become impassable with rain. The pleasantest way of seeing the marshes is to charter a little steamer at Pińsk. The journey starts on the river Strumień, then on the Pina and then the Prypeć, affectionately called the *Starucha* (the old lady) because it has several times changed its course but always comes back to the old one again. There is much bird life: storks, herons, grouse, and many lesser birds; one sees geese, cattle, and horses, and in August many heaps of hay piled up and around tree stumps. The peasants travel in long narrow rowing boats saved only by skilful manipulation from being capsized by the wash from the small steamer. Fishermen are busy with large nets fixed on frames and live in strange little huts, called *Kurin*, made of reeds.

Villages are scarce and far apart, usually compact, the cottages are of wood and one storey only; most are plastered with loam and whitened, though some of the older ones in the centre and north are of rough timber unwhitened and with small windows; very occasionally one is of brick, built by an emigrant returned from the United States with money in his pocket. One meets these people all over Poland: they never lost the desire to come back to their native village, though their enthusiasm is not always shared by those children who remember life in the States. In general the cottages have three rooms, in one of which is the stove, made of brick; they have wooden floors, broad seats round the walls or beds made of hay sewn up in coarse material. Commonly some sacred pictures hang in the corner, but with no lamp. The houses are roofed with thatch, sometimes fastened down with boughs of trees. The doors in the buildings are of tree trunks with their boughs still attached to save mortise and tenons.

The houses are of course very combustible and once a fire starts much of the village may be burnt. Till recently some witchcraft survived, certain old women knew the incantations to be spoken as flowers are thrown into the fire to bring it under control. Deliberate firing of haystacks for motives of revenge sometimes occurs, and the stacks of the villagers are placed close together on a raised stretch of sand so that if one peasant burns another's stack his own will be lost in the conflagration. To burn a man's house and plough up the site is the traditional peasant vengeance, while the firing of the landowners' stacks or barns was in the past one of the first signs of dissatisfaction or political unrest.

The cottage gardens produce vegetables, some of which however are lost by flood, and most peasants have beehives made out of large hollow tree trunks, with a few holes bored for the bees to get in and out, and a door for the removal of honey. The region has always been famous for its honey.

The Tsarist government had kept the whole marsh region in an extremely backward state for strategic reasons. Few developments or drainage works were undertaken, and no roads were made. There were no schools and the people were almost all illiterate. The isolation was almost unbelievable. During the years 1914–18 some of the peasants did not know that there was a war on, and only suspected something because no official came to collect the taxes. In some parts a motor car was till recently such an object of terror that the peasants crossed themselves and prayed when one passed them. In the villages we were introduced as Americani. I endeavoured to explain the

difference but was politely informed that the villagers had never heard of England and that anyway all foreigners were Americani.

Everything had to be produced at home. Utensils, implements, even locks for the doors were of wood; indeed Pawłowski speaks of these people as living in the age of wood. Yet they have distinctive peasant arts: their weaving in particular is very attractive. The material is linen. The flax is grown and retted locally, the fibre is spun and dyed with vegetable dyes, also home-made; a red colour is made from alder, a brick red from wild thyme, copper sulphate added to these (a recent device) gives a blue, while peat extract gives a dull black. The thread is mounted on the loom as the warp, but in the best of the work the weft, instead of being carried in a shuttle, is on a needle which is skilfully threaded across. Very attractive patterns thus become possible, but of course the work is slow. The most beautiful work comes from the wettest and most inaccessible villages, as here the women have most time on their hands and least material. Bast footwear and sheepskin coats are common, and the women wear brightly printed cotton squares on their heads.

As usual among illiterate people the age of marriage is low, even for Poland, no fewer than 25% of the brides being under nineteen, while the birth-rate is the highest in Poland (34 per 1000), as is also the natural increase in population (19 per 1000). This has necessitated a good deal of emigration to the western regions during spring and summer, but the peasants return for the winter. Formerly there was much migration to Brazil and to North America.

Another consequence of these conditions was a tendency to idleness and to drink, and unfortunately it was vodka. Men and women both indulged, those who had the money sometimes rather heavily. Richer farmers would sometimes buy one hundred bottles of vodka for a wedding feast: without it there would be no festivity. Fortunately more temperate habits are developing in consequence of the financial crisis, education, and it is said, the spreading Baptist movement.

A survey of Kobryń (75 miles west of Pińsk) recently made by Jakubowski[1] gives a concrete illustration of the conditions. The population of this district increased by 58·6% during the ten years 1921–31, when it stood at 114,171; much of this was by repatriation. Eighty-five per cent were dependent on agriculture and only 6% on industry and crafts; subdivision of the land therefore necessarily continued and over 50% of the farms were under 5 hectares in size. The dietary, as elsewhere in Polesie, is: Rye bread, potatoes, cabbage soup (*barszcz*), millet porridge, and in the marsh fish, especially the celebrated *Wnuj*. The only fats available are lard and linseed oil and then only during periods of hard work. Sugar is a great rarity, eaten only by the richer peasants during festivities, which fortunately for them are fairly common. As occasional treats are white bread, rolls, and herrings.

Improvements effected by the Poles.—The Poles set about improvement in

[1] J. Jakubowski, 'Stan Spoleczno-Kulturalny Wsi Pow. Kobryńskiego,' Zagad. Pracy Kult, Rocznik II, Warsaw 1936. I am indebted to Dr. A. Waligórski for this reference and summary and for other help in preparing this paper; also to Professor Żółtowski of the Polish Research Centre, to Dr. and Mrs. Kleczowski, and to Mrs. Conbridge-Patkaniowska.

two ways: education, and better economic conditions. Education was made compulsory between the ages of seven and thirteen, but subject to the proviso that no child is expected to go more than 3 km. to school. It was necessary to start from the very beginning, and as there was very little money the schools were still inadequate right up to the war. One I visited in Bereźce opened in 1928 and had in 1934 one hundred and seventy-four children but only two teachers, and two rooms with two classes in each, the walls bare and undecorated, the seats and desks uncomfortable. But the teachers greatly impressed me.

The improvement in economic conditions required drastic changes in the land system, drainage and other land amelioration, and better marketing methods. Throughout these eastern regions the peasants' holdings were in strips scattered so that each should have his share of good and of bad land. The crops were arranged roughly in three courses: rye (the most important), other grains, uncropped fallow. The chief crops and their areas in thousand ha. were rye (278), potatoes (134), oats (84), barley (36), wheat (24), linseed (14), and millet (11). But the rest was no longer all uncropped. One of the great improvements fostered by the Poles had been the increased growth of potatoes and other crops in place of the old fallow. But the yields were still low, only about one-half those obtained in the west. Cattle (Polish Red) were increasing and were in 1936 more numerous per thousand of population than elsewhere in Poland: they were used for meat rather than milk. Sheep are also numerous here and to the north; elsewhere in Poland there are few; they provide wool for weaving and their skins are made into coats.

The land was not economically used. One holding of 20 hectares had 2 ha. of rye, 2 of oats, 1 of potatoes, and 4 of meadow, and 10 in wild grass and other use. On the large estates also there was much wild land: a 16,000 ha. estate had only 110 arable, cultivated, however, on a good rotation and yielding well: potatoes, oats, red clover, rye, white clover, rye; 200 ha. were forest, and the rest was wild grass; it was devoted to the breeding of horses and of the Red Polish cattle. Even in 1938 the estate had not fully recovered from the destruction wrought by the Germans in 1914–18. But improvement was going on: fifty-five thousand holdings, an aggregate of 500,000 ha., were consolidated in Polesie between 1919 and 1936.

A great scheme for the development of Polesie was started in 1931. An annual income of 300,000 zł. was provided of which 10% came from local taxes and the rest from the Central Government, the region being as yet too poor to pay more. An experimental station had already been started in 1925 at Sarny on the river Słucz to study the possibilities of agricultural development. First the land had to be drained. Main channels may be up to 12 m. wide and 4 m. deep, the secondaries, $1\frac{1}{2}$ m. wide, $1\frac{1}{2}$ m. deep, spaced at 25–100 m. Then the land is ploughed and the native vegetation completely buried, fertilizer is added, and hardy grasses sown: *Dactylis*, *Alopecurus pratense* and *beckmanii*, *Festuca rubra* and *pratensis*, *Phleum pratense*, *Poa pratense*, *palustris*, and *seratina*, also Swedish and red clovers. The total cost may be 220–350 zł. per ha.: 100–150 zł. for main drainage, 60 zł. for the trenches, 60 zł. for seeding, and 60 zł. for manuring. The Government paid 6·12 zł. per quintal for the hay, so that the cost of reclaiming was about the price of

50 q. of hay. The cost is borne by the landowners or by a State loan obtainable at 3%. Striking results are obtained. The wild vegetation, rushes and sedges, myosotis, spirea, potentilla, herb robin, mint, *Polygonum aviculare*, buttercup, but very little grass and no clover, may yield 10 q./ha.; improved land yields six or eight times as much and of better quality. A peasant with 10 ha. had before improvement three cows only, but could not feed them properly; after improvement he had eleven cows much better fed and had hay to sell. This kind of improvement could be widely extended if Russia would consent to a general lowering of the river levels.

The manurial results are much like those obtained on the fens of Holland, showing how marsh conditions smooth out the effect of climate. The same curious 'reclamation disease' occurs, requiring the addition of about 35–55 lb. copper sulphate per acre. The possibilities of improving the arable crops are also considerable; while the average yields in the marsh for potatoes are about 80–90 q./ha., those at Sarny are 300–400, and 20–30 of rye against an average of 8–10 q./ha. In the Pińsk powiat some 10% of the 130,000 ha. of wild land had been reclaimed between 1935 and 1938, while in the whole province 52,000 ha. has been reclaimed and no less than 200,000 ha. has been cut out of large estates, to make small farms.

Considerable progress was made with horse breeding, the best of which was done on the larger farms. The Army was the chief buyer and set the standards, but Polish country people are very fond of horses, and landowners and peasants are equally proud of a good turnout on Sundays and feast days. Some of the children, girls as well as boys, are excellent riders. The native marsh cattle were not so good as the Polish Red, and were therefore being displaced by these: the native pigs had some useful qualities, but were less useful than the Large White crosses.

Proper exploitation of the timber was organized. It was railed to Gdynia, or floated along the canal to the Bug and thence to the Vistula, or worked up at one of the local factories. The fishing was also being improved. A biological research station was established at Pińsk in 1937 to study the biology of the rivers, beginning with the distribution of the crayfish and its parasites, and the bacterial disease, which twenty years ago had almost exterminated them. They were a valuable export, mostly to France. Peasant industries were encouraged. Cooperative societies and Peasant Women's Associations were formed, and attractive shops established in the chief towns so as to avoid the bane of peasant arts and crafts, the middlemen who underpay the peasants and overcharge the purchasers. The culture of apples and of plums was also developing, especially in the west on the loamy soils. The wild plants were also being better used: medicinal herbs, berries such as cranberries (*Oxycoccus*), reeds for thatching and for transport to Warsaw to be made into mats. An annual exhibition, the Jarmark Poleski, was to be held each year in Pińsk in August to show the progress and the products.

The northern regions: Nowogródek and Wilno

North of the marsh is the województwo (province) of Nowogródek, well above the marsh level; it is traversed by the Niemen and by the railway from Warsaw to Moscow: the country is undulating, about a quarter is forest, and

about 35% is cropped, chiefly with rye, oats, and potatoes. The yields are higher than in Polesie or in Wilno, much more barley is produced, and the peasant's dietary is better; barley porridge takes the place of the millet porridge of the marsh and the buckwheat of the north. The houses are of wood logs or planks roofed with straw, tiles, or sheet iron; many of the fields are large.

The population is almost entirely rural, and less than 10% live in the towns. As throughout the eastern provinces the population differs greatly between town and country; in the town about 40% are Jewish, 45% Polish, and only 11% White Ruthenian, while in the country less than 4% are Jewish, on the average 53% are Polish, and 42% White Ruthenian, but in some districts more. The largest town, Baranowicze, had only 23,000 inhabitants in 1931; it is the railway junction where the Warsaw–Moscow line crosses the north–south line from Wilno to Lwów. It has no architectural or historic interest, yet contrived to make itself look very gay for the soldiers' fête day on August 15 to commemorate the Miracle of Warsaw, the defeat of the invaders of 1920. Only two other towns have more than ten thousand inhabitants; Lida and Słonim.

The province of Wilno is more picturesque and historically more important. It is in the moraine country, its lakes including Narocz, the largest in Poland; its many hills are low but steep, usually well wooded; the plains are wooded and much cultivated. The cottages are of wood, with straw thatch. The soil is sand or clay, usually poor and acid, and less productive than that to the south; the chief crops are rye, oats, potatoes, but little wheat or barley. Buckwheat however is grown more extensively than anywhere in Poland, also flax and peas. There are far fewer cattle than in Polesie or Wołyń, and fewer per 1000 ha. than in Nowogródek; on the other hand there are many more sheep than elsewhere in Poland and they were increasing, the figure for 1937 being four times that for 1921.

As in the other regions much of the land is in small holdings, about half being 5 ha. or less (*i.e.* below the poverty-line), and 15% were actually below 2 ha. There is much strip farming, some strips being very small. The population is not quite as largely rural as in Nowogródek or Polesie, some 20% being urban in 1931; in the country 60% are Polish, 28% White Ruthenian, and 3% Jewish, while in the towns 63% are Polish, 29% Jewish, and 3% Ruthenian. Almost all of the Ruthenians were small farmers, wanting only to be left in peace, free to use their own language and practise their own religion; they are mostly Greek Orthodox now, though in the old days they had been Greek Catholics. White Ruthenian secondary schools had been started; I was informed that they were not a success through lack of pupils. As elsewhere in the eastern provinces illiteracy has been bad; 60% of the rural population above ten years of age were unable to read and write in 1921; this was reduced to 33% by 1931.

I have visited several well-managed large estates. One south of Wilno had 3000 ha., 1000 of which was arable; its yields of rye and potatoes were double the average, though even here oats and barley did not do well and wheat was not attempted. The grassland was being improved as on other good estates; and a good herd of Frisian cows gave high and increasing

output of milk; cheese was successfully made. The pigs were Large Whites, a popular breed in Poland, suggesting one of the many ways in which we shall be able to help after the war: the large building housing them was provided with loopholes out of which the guards could shoot the wolves in winter.

On another estate, equally well run, special efforts had been made to develop the fishponds, a great industry in Poland. Carp are the most usual; they are fed with lupin seeds, and thousands of acres of water are devoted to them; indeed on some estates I was told that more could be got out of a hectare of water than out of a hectare of land. In 1938 the annual production of carp in Poland was about 12,000 tons, and another 14,000 of carp and pike came from the lakes, 26,000 tons in all, nearly sufficient for national needs. Most of the carp was said to be eaten by the Jews as a "meritorious act." One estate producing trout had ingenious devices for attracting insects to the water; electric lamps were submerged just below the surface and lighted at night; horse flesh was also given. A special society is concerned with these pond fisheries.

It is impossible to speak of these country houses without a feeling of regret that they should have suffered so badly and for so long. The breaking up of the big estates is bound to affect them. Hospitality is an ancient tradition with them; one hostess told me that in her grandmother's time rarely less than fifty had sat down to dinner, and in her own childhood they were rarely less than fifteen, including the French and Polish governess and the poor relations. As in England the country houses expanded in the 1860's, when money was plentiful though for different reasons than here; the emancipation of the serfs brought in compensation funds, timber began to have value, and the development of transport enabled agricultural produce to be sent to distant markets. A period of fluctuating fortune followed, ending with the war of 1914–18 when the Germans destroyed or plundered everything they fancied, including the books. Then came twenty years of slow but steady reconstruction to the high standard finally reached in 1939, and now, this renewed devastation.

Two central agricultural experimental stations deal with agricultural problems. At Bieniakonie, 35 km. south of Wilno, cereal crops are studied under Professor Łastowski. The central flax station, under Professor Jagmin, at Nowa Wilejka, near Wilno, deals with home-grown fibres; it is located here because this province is the largest producer of flax in Poland, and Poland is the second largest producer in the world. Its programme illustrates the ingenuity with which the Poles were attacking their problems. Raw textile materials were imported in considerable quantities and paid for by subsidized exports of cereals, sugar, and other agricultural produce really needed at home. The annual consumption of sugar per head in Poland was less than half that in England. Tales were current on the frontier of considerable smuggling back into Poland of sugar sold to an adjoining country at less than the home price. It was decided therefore to replace some of the cereals with fibre crops which in any case were worth about three times as much per hectare. Cotton and jute, the two most needed, cannot of course be grown in Poland, but investigations were started to see if flax, hemp, and abutilon

Market place and Dominican Convent church, Lwów

Wilno: The church of Ostra Brama

Strip cultivation, Wilno province

Country house in Dniestr valley

Professor Jagmin and experimental garden for fibre plants: Wilno

could be changed into something sufficiently like them to be effective substitutes.

The exploitation of the forests involved some difficult problems, so much damage having been done by the Germans. About 20% of the province is forest, nearly half being State-owned and the rest in private hands; but the State exercises considerable control, requiring a proper survey and a ten-year plan of cutting and regeneration to be approved by the Forestry Department and carried out. Much timber is exported as coniferous sawn wood, but efforts are made to sell it in manufactured form; the Wilno district produces some 70% of the plywood and veneer of Poland.

Transport however was difficult. The natural outlet is the Niemen, but unfortunately this passed also through Lithuania and Prussia, and the navigation restrictions made it useless. However the Poles never accept defeat, and they established several pleasant 'Plages' upstream from Wilno. Libava was the nearest port by rail, but it lacked all facilities; Memel was also near. But the only practicable ports were Danzig and Gdynia, a long way off, and Danzig was becoming politically hostile. Timber was Poland's chief export and we were the chief buyers.

The administrative and cultural centre of the province is Wilno, one of the most attractive cities in Poland. It is built on the moraine hills, and the Wilja, a tributary of the Niemen, cuts through it in a sinuous course. The hills are not high, but they are steep, and they effectively prevent any rectangular layout of the city; they afford however many pleasing views over the city. It was a favourite residence of King Sigismund Augustus in the latter part of the sixteenth century, Poland's golden age, and must have been magnificent if we can judge by the few surviving Gothic churches, and especially St. Ann's, and the remains of the Castle; these were being cleared and conserved. Here Barbara Radziwiłł lived and was buried; till this war her crown still rested on her coffin in the Cathedral; from here too started King Stefan Batory's road to Polotsk; it was reconstructed by Catherine the Great and planted with beech trees, and is still in use.

Like other Polish cities Wilno suffered greatly in the wars of the seventeenth century; some of the churches were rebuilt in the Baroque style with Italian help; in the early eighteenth century there was damage by fire, and the new churches were Rococo; later came the more severe classic styles; in the nineteenth century the Russians introduced some Byzantine work. From the hills one gets the impression of a city of spires and chestnut trees, and as one wanders down the narrow winding streets one finds many little courtyards often adorned with arcades and gardens and pleasing nooks and corners. Window boxes of flowers are popular; the police stations led the way. The people are attractive, with soft voices and a singing intonation. One can understand Piłsudski's affection for Wilno and his declaration that it was one of the most beautiful cities in the world; he was born here, and here his heart is buried in his mother's grave, which is placed among the soldiers' graves, as befits the mother of a warrior.

The University was founded by Stefan Batory in 1578 as a Jesuit Academy; it grew into a great seat of learning but was closed by the Russians after the 1830 insurrection and the Polish language was forbidden. Many stories still

survive of the repressions from then on to 1922, when it was reinstated by Piłsudski. But it is pleasanter to think of Napoleon's connection with Wilno; he passed through it in July 1812 on his way to Moscow, making a speech that sounds curiously modern about his noble aims and devastating intentions; but he came back in October in a sledge, travelling under another name. The road on which he passed was shown me and the story told of how he was nearly captured by Cossacks but was saved by some Poles who, my informant added, were thereby the cause of Waterloo. Caulaincourt mentions the Cossacks but not the alleged narrow escape.

Wilno is also an important religious centre. Some of the old Russian Orthodox still survive as the Eastern Orthodox Church of Ancient Rite; their predecessors had fled hither in the time of Peter the Great because they disapproved his ecclesiastical innovations. At Raduń is a well-known Rabbinical college, while at Troki are the Kariem, an interesting sect of Tartar origin who came from the Crimea in 1398; they combine many of the tenets of Judaism, Muhammadanism, and Christianity. But as only those born in the community can become members, and no converts can be accepted, their numbers are falling. They live very strict lives and are greatly respected.

The southern regions: Wołyń and Eastern Galicia

South of the marsh regions the country rises in two steps: first comes Wołyń, a plain some 200 m. above sea-level and about the same size as Polesie; then farther south on higher ground another two provinces, Tarnopol and Stanisławów, which correspond roughly to the old Eastern Galicia, together the same area as Wołyń, but with considerable differences, both natural and political. Wołyń, like Polesie, is a plain and has about the same rainfall, but it is more fertile; its chief crops are rye, wheat, oats, and potatoes; but with much more wheat and barley than farther north, yields are higher and cattle and pigs more numerous; there were however fewer sheep. Both at Dubno and at Kowel there were factories for preparing bacon, tinned ham, and lard for Great Britain and the United States. More land is in agricultural use (66% against 50% in Polesie) and only 20% is forest: it is altogether better country.

Eastern Galicia stands higher, has somewhat higher rainfall (690 mm. at Lwów), it has considerable stretches of fertile loess soil, and grows a much wider range of crops. Wheat is more important; indeed in the Tarnopol province it actually exceeds rye in area; there are also sugar beet, tobacco, flax, hemp, and two crops which are confined to the south-east and show the warmer character of its summer: maize and grapes for wine.

Both in Wołyń and in Eastern Galicia the rural population includes many Red Ruthenians, but with considerable differences. Wołyń was under Russia and, like Polesie, was kept in a backward state for strategic reasons; illiteracy was as common as in Polesie, no fewer than 85% of women and girls over ten, and 63% of the men and boys living in the country districts being unable to read and write in 1921. Eastern Galicia, on the other hand, was under Austrian rule, which was much more lenient than that of Russia or Germany. Some education was permitted, and in 1921 illiteracy was lower than in Wołyń, except in the remote districts where the people were very

backward. But as against this the Austrians tried to lighten their task of government by fomenting trouble between the Poles and the Ruthenians, and this left a host of difficulties for the Polish Government.

From its soil and climate Eastern Galicia ought to have been fairly prosperous, but it has always been poor. For centuries military adventures of many races have passed through it between Kiev and Lwów; the peasants have always been in the way, and have suffered accordingly. Dr. Styś (Vincent Styś, Arch. Towar. Nauk. Lwów, 1934) worked out the history of twenty of the villages and showed the devastation caused by wars, famine, and pestilence, especially cholera, smallpox, and typhus. Their high birth-rate had saved them during war and pestilence, but it nearly ruined them in peace time by putting too great a pressure on the land. The shrinkage in size of holdings is shown in the following figures taken from Dr. Styś' paper:

Annual change per cent in	1787–1820	1820–50	1850–83	1883–1931
Population	+0·439	+0·610	+0·515	+0·822
Number of peasant holdings ..	+0·334	+0·903	+1·047	+1·098
Total area of holdings	+0·154	+0·116	+0·003	+0·349
Mean size of holdings	−0·163	−0·618	−0·778	−0·492

It has become a region of dwarf farms; in the various districts from half to two-thirds of the total holdings in 1921 were less than 5 ha., usually divided into strips. Approximately half the population is Polish and half Red Ruthenian, these being divided into Ruthenian and Ukrainian; in the south however there are fewer Poles.

When I first visited Eastern Galicia in 1930 there was still much war damage: broken bridges and wrecked houses. But the children had known only peace and isolation; they ran away terrified from our car. Women and girls in their nicely embroidered costumes, much brighter red than in the north, were working in the fields, cutting the corn with sickles; they had dimpled cheeks but not the high cheekbones of some of the other Slav groups. There is a certain amount of gloom and slowness of thought in their make-up. Maize enters largely into their dietary. The villages are compact; the houses of one storey only, made of wood frame only partly hewn, and filled in with straw coated with loam and then whitened or coloured pale blue. The straw-thatched roof is built in a characteristic overlapping style. Not infrequently there is no chimney; any smoke lingers indoors to help in the warming. Water is lifted from the wells either by the long pole lever or by a wheel.

Considerable improvement had been effected by 1936. The new cottages were of wood or brick, often with sheet-iron roofs painted red or green. Many thousand farms had been consolidated and some 200,000 ha. had been taken from the large estates and used for peasant holdings. Advancement became possible: one peasant in the Dniestr valley told me he had started with 2 ha., and by dint of hard work had now got ten. But the holding was not stable and his two sons would share it when he died. Fragmentation continues. New farms are exempt but a so-called "hidden subdivision" was going on, two or more families living on the same holding.

Some of the large estates were very productive however. One of 10,000 ha.

in the Dniestr valley region had 4000 ha. of forest, 2000 ha. wild grass, and 2000 ha. cultivated, of which 1200 ha. were arable, 200 pasture, and 400 fish ponds. The permanent staff numbered 120, summer workers another 200, with a further 50–200 at harvest. The wages were paid mostly in kind; they were, per annum in 1936: 15·3 q. (27 cwts.) of cereal grain per family; the use of 1/3 ha. of land for potatoes; manure, horses, and implements being provided by the estate, but not seed; 1/3 ha. of pasturage for the cow; free wood and medical attendance. Minimum wages were fixed by a commission. The number of families employed would probably not much exceed one hundred and fifty. Had it all been divided into 20 ha. holdings it might have provided for about two hundred families. But the same high standard of production could hardly have been maintained: the rich, clean milk, tuberculin tested, the high yields of grain, sugar beet, and colza. The house, though smaller than some, was a choice specimen of Polish taste and culture; the hostess, speaking English perfectly and with a considerable knowledge of Polish art, had a beautiful collection of books and prints, much attractive furniture and tapestry; it was a house where one could stay indefinitely. She was keenly interested in the estate and in the peasants; she ran a kindergarten, and medical services for the children; not wanting to make money out of the enterprise but simply to keep it going and help her people. It was a little island of the best Polish culture in a Ruthenian population.

The centre of commerce and of culture for this southern region is Lwów, called Lemberg during the Austrian occupation. It is an ancient city founded in 1250 by the Ruthenian Duke Lew, but Polish since 1340. Traffic was mostly by river; and the city was built on the Peltew, a tributary of the Bug, at the dominating point where a short portage linked up the Dniestr and the Bug over the low watershed; it was thus at the intersection of the routes from the Black Sea to the Baltic and from each of these seas to eastern and central Europe. It rapidly became a great trading centre and attracted settlers of many nations, including Scotsmen. It also achieved much political importance as the final bastion stopping the progress of invaders from the east: only once did it fall into foreign hands, and that was when the Swedes took it in 1704.

Lwów has the unique distinction of being the seat of three archbishoprics: Roman Catholic, Greek Catholic, and Armenian. It had become the chief centre of the oil and potash industries, and had important timber and other industries as well as much distributive commerce. Further, it became a great centre for higher education with a large university, technical colleges, and other teaching institutions. By 1931 it was the third largest city in Poland with a population of 312,000, about half of whom were Poles, a third were Jews, and the rest Ruthenians and others.

It has some beautiful churches and other interesting buildings, and on market days its big market square becomes filled with peasants dressed in gay colours, with their little stalls of fruit, vegetables, and chickens.

Summary of changes and developments

We can now sum up the changes in the eastern provinces since Poland took them over. The population was very mixed. In the towns the Poles

and Jews preponderated; in the country districts there were very few Jews; the Poles and one of the groups preponderated, Red Ruthenians in the south, White Ruthenians in the north, and Polesians in the centre. The Poles were in a minority in a number of districts. No line of separation between the various groups could be drawn. Minority problems therefore became inevitable, and two actually arose: the Ukrainian and the Jewish.

The central marsh region had been left entirely undeveloped by the Tsars and the northern regions were not much better. There was no educational system, and the people were almost entirely illiterate.

Throughout the eastern region almost all the land had been held in large estates, the owners being Poles. The peasants' land was farmed on the strip system, each man's strip being allotted on the principle that each was to have his share of good and of bad land. The system was of low productivity and incapable of improvement. Further, at the peasant's death his land was divided between all his sons[1]; it was not confined to the eldest as here. Dowries, which could be livestock, had to be provided for daughters. So the peasants became poorer and the inevitable results followed: early marriage, high birth-rate, high rate of natural increase, greater pressure on the land, further fragmentation of the holdings. The situation was worst in the south, and this, coupled with the legacy of trouble fomented by the Austrians, led to the Ukrainian problem.

The Poles began quite rightly by improving the land situation. The peasant is not interested in political theories or systems of government: he tolerates almost any system that gives him sufficient land and peace to cultivate it. But trouble is always likely when fragmentation has gone too far. Land reform was therefore started in four directions: consolidation of the peasant's holdings by exchange of strips so as to bring each man's holding into one compact piece; opening up of Government land and breaking up of large estates; reclamation (usually by drainage) of land which was either waste or not fully utilized; and abolition of embarrassing liabilities. In general estates might not exceed 300 ha. of cultivated land in the eastern provinces or 180 ha. elsewhere, forest and water not to count. The breaking up was hastened in the eastern provinces by the Russian Revolution. In the six eastern provinces 2,230,000 ha. had been consolidated, 1,162,000 ha. had been parcelled out into 305,000 farms, 209,000 ha. had been improved by drainage, and liabilities on 264,000 ha. had been liquidated, all between 1920 and 1936.

More amelioration work was done in Polesie and Wołyń than in any other province in Poland except Lublin. The breaking up of the large estates was completely altering the social structure of the region, but it was vigorously pursued, especially by Mr. Poniatowski as Minister of Agriculture. As the large estates often obtained higher yields per hectare than the small ones, the breaking up meant a fall in yield per unit area. But the gain in production caused by consolidation and amelioration more than offset this loss and the total production showed a substantial increase in spite of the fall in average yields of rye and wheat.

[1] This is general, except that a few of the larger estates, e.g. the Radziwiłł, Czartoryski, and others were entailed.

All Poland: Production in thousands of metric tons and yields in quintals per hectare

	Rye		*Oats*		*Wheat*		*Potatoes*	
1909–13 ..	57·11	11·2	28·14	10·2	16·78	12·4	247·9	103·0
1932–36 ..	65·26	10·9	25·72	11·6	19·49	11·2	317·1	114·0

Cattle had increased from 9·06 million in 1929 to 10·20 in 1936; pigs from 4·83 to 7·06; sheep from 2·49 to 3·02. The average yield of milk per cow rose from 3022 to 3172 kg.; that on farms under 50 ha. from 2433 to 2560; on farms over 50 ha. from 3219 to 3337 kg. (1 quintal per hectare is 0·8 cwt. per acre; 1 kg. of milk is 0·22 gallons.)

Further improvement was effected by means of education and advice based on research carried out at Experimental Farms and Research Stations. All children up to the age of thirteen had to go to primary schools. Agricultural schools were set up for boys of seventeen to twenty, and some for girls; by 1936 there were in all Poland about one hundred and sixty of them, each with 10–50 ha. of land, and taking forty to fifty scholars for an eleven-months' course. About ten Rural Universities on lines of the Danish Folk Schools, provided short courses for adults, and also a twelve months' course (described in Wiejskie Uniwersytety Ludowe w Polsce, Warsaw, 1938), and were started from the well-known Lyceum Krzemienieckie in Wołyń.

The advisers were centred at an experimental farm, and besides giving advice to the farmers arranged periodical visits so that new methods could be demonstrated. Special ways of approaching the peasants were adopted, including the so-called 'Teams of agricultural preparation,' and the 'Popular Halls'; altogether some thousands of adult students were enrolled. In addition Community Houses were set up as centres of social life in the villages.

The agricultural system was also improved. The chief product had been grain. Unfortunately prices fell disastrously during the crisis years of 1930–33; it was estimated that agricultural earnings fell by 60% (Curzytek, Puławy Monographs). Peasants were therefore encouraged to carry their production a stage further; instead of selling rye at 15 zł. per q., to improve their grass and feed their grain so as to produce cattle at 65 zł., or pigs at 90 zł. per q. live weight, or butter at 280 zł.; further, the animals should be worked up into finished products: bacon, and sausages.

Credit and marketing had been almost entirely in the hands of the Jews, who lent money and bought the bulky commodities, the grain, potatoes, cattle, and pigs, and transported them to the towns; while the women took the smaller articles, the eggs, poultry, fruit, honey, and anything else they could carry to the nearest market and sat down in the market-place awaiting customers. This made one of the most attractive pictures of country life throughout Poland. The peasant women are very sociable and have a keen sense of colour; the market was always bright and animated, and they clearly enjoyed it and would not lightly give it up.

But the Jewish middlemen were not popular. They never competed one with the other, indeed it was said that the rabbis would allow only one trader per village, and the peasants suspected that they were not being sufficiently paid. The difficulty was met by the establishing of Cooperative Societies, the most popular being the Credit societies. Consumers' societies supplied

goods, but some at least would take peasant produce in exchange; and Dairy or other cooperatives took the peasants' raw materials and worked them up into finished products, converting milk into butter or cheese, pigs into bacon, grading and packing eggs. All three kinds were substantially increasing in membership; for the years 1928 and 1935 the figures were, for all Poland: Consumers' Societies 2022 with 252,000 members in 1928 and 2586 (319,000) in 1935; Dairy Societies had 1430 with 211,000 members in 1928 and 438,000 in 1935; Credit Societies had 3535 with 762,000 members in 1935. The Agricultural Consumers' Societies were mainly Ukrainian, but the Credit and Dairy were mainly Polish.

But there still remained more population than agriculture could carry. In the old days there was much migration to the Americas, but that had been stopped, indeed there had been some reversal of the process and some repatriation had occurred. Industries were therefore developed and manufactured products exported instead of raw materials. The Kwiatkowski Reconstruction Plan was put into operation in 1936. Worked wood and not only raw timber was sent from Polesie, Wilno, and Lwów.

Eastern Galicia had two sets of products. Potash salts were mined at Kałusz, and the output was increased from 14,000 tons in 1913 to 434,000 tons in 1936, and 560,880 tons in 1938. Oil and natural gas were worked in the Lwów and Borysław regions, although the depth of the wells (1500–2000 m.) made competition difficult with Romania, where they are 150–500 m. deep; nevertheless much development was effected and about 500,000 tons of paraffin were obtained in 1936, while the natural gas was piped to Lwów.

Great progress had been made in dealing with the transport problem. No reparations money was available, yet the port of Gdynia was built: the railways were reconstructed and put on to the European gauge; bridges and culverts were repaired. Roads were made, and this was often difficult because in the north only moraine stone is available, and in the south only the granite quarries of Wołyń and of the higher country farther south. The power problem was also being dealt with and the supply of electricity was increasing. The standard of housing was being improved with a view to deal with the overcrowding which was a marked feature of the villages and especially of some of the towns.

Economic progress had been good up to 1928 but was greatly set back by the crisis years of 1931–33 and recovery was very slow, but by 1938 it was perceptible. The villages seemed happier and there was life and movement in the towns. The chief internal troubles were the minority problems: the Ukrainians and the Jews. The Ukrainian trouble was kept alive by outside propaganda, otherwise it looked like subsiding as the result of improvement in the land situation, and the Polish recognition of Ruthenian right to free national development, the establishment of Ruthenian schools, Ukrainian Cooperative Societies, and measures of local self-government.

Looking back over the ten years it is clear that Poland has very faithfully dealt with these eastern provinces. Remarkable progress was made and more seemed to be coming. The difficult land problem had been well attacked, the terrible poverty of the peasants had been mitigated, and the way lay open for steady economic improvement. Education was everywhere being made

available and illiteracy was fast disappearing; the educational ladder though not complete was nevertheless developed and peasant children were in fact stepping up to higher posts. Reconstruction was going on, natural resources were being developed, the younger generation were genuinely trying to help the peasants and to make them realize their share in the country and its government. Had Poland been vouchsafed fifty years of peace a satisfying degree of comfortable life would have been attained; not great material riches, but something much more valuable; good standards of culture and civilization.

DISCUSSION

Before the paper the PRESIDENT (the Rt. Hon. Sir GEORGE CLERK) said: This afternoon Sir John Russell is going to tell us about Reconstruction and Development in Eastern Poland. He travelled much in Poland and Russia in the years before the outbreak of war, and no man is better qualified than the Director of the famous Rothamsted Experimental Station to give us an authoritative account of a country in which the improvement of agriculture was playing so large a part.

Sir John Russell then read the paper printed above.

The PRESIDENT: We are privileged to have with us this afternoon H.E. the Polish Ambassador and Foreign Minister. I wonder whether His Excellency would add a word or two on the interesting paper we have had from Sir John Russell?

H.E. THE POLISH AMBASSADOR: After such an interesting lecture there is little I can add and I do not feel that I can trespass on your patience. I should however like to remind you that Sir John Russell is one of the great experts on the part of the world he has described. He very modestly did not speak of the particular work he was doing in Poland when each year he took a certain number of students from England to that country to see what was being done in connection with agriculture and to visit our schools of agriculture. I can only say that when Sir John speaks in general terms of the efforts made to improve agriculture in Poland he certainly speaks as one who knows.

In a lecture so comprehensive and interesting Sir John has necessarily only been able to cover part of the ground. He mentioned the backwardness of the country; that it was undeveloped, and at the same time praised the efforts of the Polish Government to raise the standard of life of the people and to raise the country as a whole to a higher mode of life. He was not able to go into the reasons for that backwardness which of course are closely linked with the history of Europe as a whole and of Eastern Poland in particular. There is no doubt that the Polish Government was trying very hard to develop and to improve the standard of life in all its aspects. Many items other than agriculture came into the picture. For instance, the development of the network of roads which, traditionally, always very poor, had been much improved. On the whole, it was somewhat paradoxical to find some of our high roads in the east were better than those in the central and western parts of Poland. Much was also done by way of development and improvement of the towns; new schools were built and new industries created, such as the flax industry mentioned by Sir John; and even the export of certain products was attempted with some success. In addition, better livestock was available and the newly formed factories were able to supply, in fairly good condition, the fertilizers needed for the improvement of agriculture, although the fertilizers were not used to the extent they should have been.

That, in a way, is an idyllic picture of peaceful effort and of constant although slow improvement. All that was put an end to in a violent way, and the whole of the work will have to be begun anew. When I consider how slow and how difficult was the beginning of that work, and when I recall the tragic history of those lands, the backwardness and the slowness are explained. Perhaps our children will be more impatient, seeing how in many parts undeveloped and primitive life has remained. They perhaps may forget even in our country, certainly in foreign countries, the strong, tragic, and serious reasons there were for that backwardness. I hope that in spite of the incredible disasters, in spite of the destruction of so many houses and towns, many of which have disappeared or been largely changed, fortunately the large towns, such as Lwów and Pińsk, have suffered less than some others, and many of the private houses will not for ever cease to exist. I hope that in spite of the unspeakable disaster and the great wreckage all over my country, we shall before long be able to re-start our work, and perhaps in better conditions and with more prospect of stability than during the last twenty years. I trust that when the war is over we may find in Great Britain, and in the west in particular, the source not only of moral but of material help which will speed up our important work.

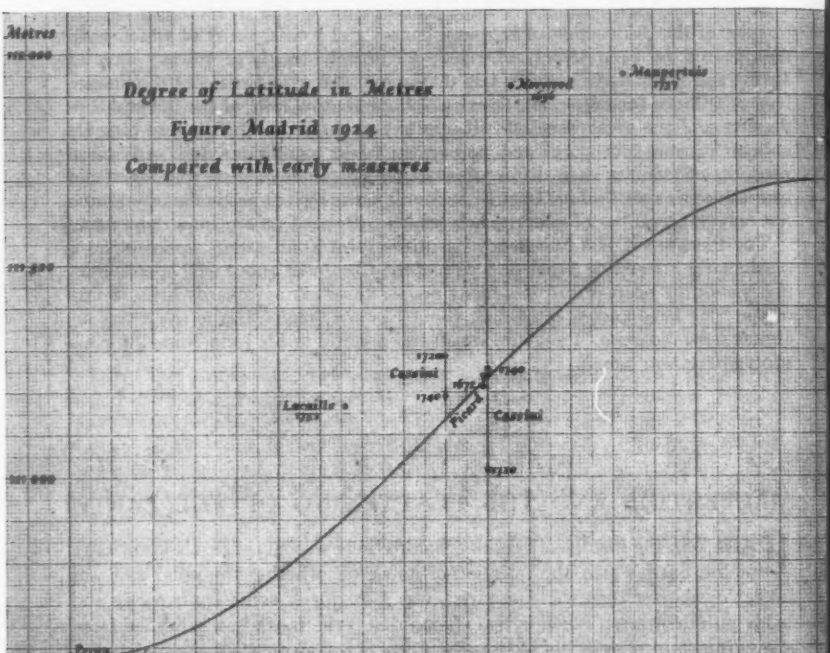
The PRESIDENT: His Excellency has made most illuminating comment on a particularly interesting paper on a part of the Continent about which, considering it is in the heart of Europe, many people know extraordinarily little. Some of you may have known something about Eastern Poland, but to me it was an almost *terra incognita*. I am sure we all feel grateful to Sir John Russell for his most interesting paper.

MAUPERTUIS AND THE FLATTENING OF THE EARTH

EARLY in the history of geodesy, before there was any accurate knowledge of the Earth's size, the question of its shape, whether the polar axis was longer or shorter than the equatorial, was a matter of acute controversy and lively public interest. Newton had shown that if the Earth had solidified from a rotating fluid it must be oblate, the polar axis shorter than the equatorial. The measures in France under the direction of the Cassinis, on the other hand, made the length of a degree shorter instead of longer as they went north, which implied that the earth was prolate. To settle the matter the French academicians, with great public spirit, fitted out two expeditions, one to the polar circle, the second to the equator, and the results brought back from Tornea by Maupertuis seemed so conclusively to prove the flattening that, without waiting for the more leisurely operation of Bouguer and de la Condamine on the Arc de Pérou, it was admitted that Maupertuis had, in the famous words of Voltaire, "aplati les poles et les Cassinis."

These operations are famous in the history of geodesy, but one does not see any concise statement of the accuracy which was achieved. Some ten years ago, for a lecture in a University, a diagram was made in which the various determinations of the length in metres of an arc of one degree of latitude are compared with our modern figures, which could conveniently be done then, but not much earlier, because our Society had recently published, in 1927, the

first complete tables of Arcs of Meridian, from the equator to each ten minutes of latitude (R.G.S. Technical Series No. 4). The curve in the diagram, which is now reproduced for the first time, is drawn to exhibit the length in metres of an arc of one degree of the meridian in different latitudes. It is based upon the Figure of the Earth adopted with all solemnity for international use by the Section of Geodesy in the International Union of Geodesy and Geophysics at their meeting in Madrid in 1924; and whatever



one may think of the process by which this figure was adopted, we may admit that it is good enough for our present purpose.

We see at once that Picard was in fact very nearly right at his first attempt, much more nearly right than the Cassinis in 1720. But we see also that Maupertuis was very wrong. By good fortune his error was in the right direction to prove the flattening, though he very much overdid it. But if we admit that errors of either sign are equally probable we must conclude that he might almost with equal probability have proved the reverse. He was in fact nearly as far wrong in his figures as was Norwood a century earlier. Bouguer and de la Condamine, on the other hand, obtained in Peru a result that was almost

exactly right; and when the Cassinis in 1740 revised their calculations they also came very near to the truth.

But Maupertuis was painted in a splendid costume, flattening a globe with a superb gesture; and the masterly engraving of this picture is esteemed by collectors of eighteenth-century engraved portraits. A good print, though not in the finest state of the plate, was bought for the collection of the Society in 1921.

EDMOND HALLEY AS PHYSICAL GEOGRAPHER

EDMOND HALLEY AS PHYSICAL GEOGRAPHER and the story of his charts. By Professor S. CHAPMAN, F.R.S. (Reprinted from Occasional Notes No. 9, June 1941. Royal Astronomical Society.) $10 \times 6\frac{3}{4}$ *inches; 15 pages; maps and charts. 2s 6d*

HALLEY'S fame as an astronomer, and the want of any adequate biography, have somewhat obscured his contribution to other branches of science, and Professor Chapman has done us good service in putting together this account of Halley as a physical geographer, with reproduction of three of his charts: the first of the Trade Winds and Monsoons, published in the *Philosophical Transactions* for 1686; the second showing the Variation of the Compass in the Atlantic; and the third extending the chart of variation over the Indian Ocean to the Far East, but not across the Pacific. The first has always been easy to find in the series of the *Phil. Trans.*; the second and third were in the last century so little known that Airy in 1870 "had not ascertained that any writer had ever seen it"—he never knew that there were two magnetic charts—and he made inquiries in nearly every academy in Europe before discovering a copy of the third in the British Museum, while the second was first noticed in modern times by Dr. Bauer in 1895. A fourth, the finest of the four, is a New and Correct Chart of the Channel between England and France . . . with y^{e} flowing of the Tydes and setting of the Current, which has escaped the notice of Halley's latest bibliographer, Mr. MacPike, and of Professor Chapman, though it is mentioned in the anonymous Memoir found in the Bodleian Library and printed first in Mr. MacPike's valuable work, 'Correspondence and papers of Edmond Halley,' Oxford, 1932.

At the age of seventeen Halley entered Queen's College, Oxford, but before he was of standing to take his degree embarked for St. Helena in 1676 and came back in two years with the observations for the first catalogue of the southern stars and with an interest in the Trade Winds which led to his making the first meteorological chart, that "shows an excellent appreciation of th value and power of graphical representation of geophysical data on maps" and made him "one of the fathers of physical geography." His own theory of the Trades was not successful, but so great was his fame in later years that the true theory, first given by Hadley in 1735, has been confusedly attributed to him.

In 1700 Halley went to sea again with King William the Third's commission "to be Master and Commander of his Maty. Pink the Paramour" as thus recorded in Admiralty Archives, P.R.O.: a Pink being according to an authority of 1710, quoted in the O.E.D., a vessel whose sides bulge out very much, making her difficult to board; often used for storeships and hospital ships in the fleet. An account of the two voyages made in 1698–1700 was printed in 1773 by

Alexander Dalrymple from the original manuscript in possession of the Board of Longitude, and included in 1775 in a slight volume of Voyages in the South Atlantic, not in the better-known Dalrymple. A disparaging Advertisement to the earlier book says that the Journal of the first voyage is written on sundry scraps of paper and incomplete, and that the name of Dr. Halley will raise expectations which his Journal will be far from satisfying. A much more lively account is contained in letters 48 to 69 of the Correspondence, all written by Halley to Josiah Burchett, Secretary to the Admiralty, and preserved among Captains' Letters in the Admiralty Archives, P.R.O. The *Paramour* was a new ship which developed serious leaks on her way down Channel in November 1698. These being repaired in Portsmouth Dockyard she joined Admiral Benbow at St. Helen's, being "somewhat doubtfull of going alone, for fear of meeting with a Sallyman." At Madeira Halley parted company with the fleet and sailed for St. Jago in the Cape Verde Islands, where he was on January 2 received with great and small shot instead of a salute to the flag, because one of two British ships lying in the Roads took him for a pirate under false colours. Halley thought the same of them, went in to windward, and sent a boat to learn the reason of their firing, upon which explanations and apologies were tendered but received with reserve.

The ship had got away from England two months late, and by the time Halley had been further delayed by calms and small southerly gales it was March, he was only 100 leagues south of the Line, and winter was coming on. He watered in the river of Paraiba in Brasile, where the Governor was very obliging, "but the Portuguez, as farr as I could guess, were very willing to find pretences to seize us, and tempted us severall times to meddle with a sort of wood they call Poo de Brasile which is an excellent dye, but prohibited to all forreigners under pain of confiscation of Shipp and goods. I being aware of their design absolutely refused all commerce with them" and arrived in Barbados road on April 2, whence he wrote this narrative to Burchett.

The next letter is from Plymouth on 23 June 1799. He had had trouble with his Lieutenant who, "perhaps because I have not the whole Sea Dictionary so perfect as he" had represented his Captain to the ship's company as wholly unqualified for the command, upon which he was desired "to keep his Cabbin for that night," and Halley brought the ship home from the Banks of Newfoundland without his assistance. The insubordinate officer was courtmartialled at Deal and reprimanded, not broken and dismissed the King's service, as the anonymous Memoir has it.

By August 1699 the *Paramour* was refitted and Halley was asking that he might be ordered again to make discovery of the South unknown lands between the latitudes of 50° and 55°. By September 26 he was lying in the Downs in company with "a Guiney man of 30 Gunns" who was to keep him company for 800 leagues as precaution against the Rovers of Barbary, and by October 12 was to leeward of Madeira, thinking it not advisable to beat to windward so much in the way of the Salleteens, and consequently "Obleged to putt into Ryo Jennero in Brasile to gett some Rumm" for the ship's company. Sailing southward on December 29 he fell in with great Islands of Ice in 52½° S., 35° W. on February 1, got clear with some difficulty, and was at St. Helena on 30 March 1700. Proceeding thence to "Fernambouc in Brassile . . . here one Mr. Hardwyck that calls himselfe English consull, shewed himselfe very desirous to make prize of me, as a pyrate and kept me under a guard in his house . . . notwithstanding I shewd him both my commissions and the smallness of my force for such a purpose." And so by way again of Barbados and Newfoundland he got home to Plymouth on 27 August 1700 with the observations that he

made so promptly into the first magnetic chart. We must be grateful to Mr. MacPike for disinterring these letters, which show so well the spirit and capability of the astronomer and mathematician who at forty-two was put in command of His Majesty's Pink the *Paramour*.

Professor Chapman speaks of Halley's charts as rare, a small number only preserved in the greater libraries, and by a reference to *The Observatory* (41.51, 1918) recalls the incident at a Geophysical Meeting of the R.A.S. in 1917 when another distinguished astronomer from Greenwich, lecturing on Terrestrial Magnetism, was found to have overlooked the Atlantic Chart which had hung in the adjacent room of the Assistant Secretary at least since 1874. On the following morning Mr. Reeves bought for our Society from Stevens, Son, and Stiles a fine impression of this chart from an early state of the plate, before the dedication to King William III had been engraved. Since then we have obtained two other copies, one from the original plate very much worn and retouched, though with the same dedication to the King who had died in 1702; and another re-engraved, constructed anew from observations about 1744. The accompanying Description of the former is essentially though not typographically the same as that printed by Professor Chapman; that on the latter is adapted to the later date. The track of the *Paramour* on the earlier editions is that of the second voyage only, and has misled Professor Chapman into speaking of one voyage instead of two.

Of the World Chart we have had since 1913 two copies of a late edition published by Laurie and Whittle in 1794, and in 1920 were able to buy from Stevens a fine impression of the first edition of about 1702 which seems to be identical with the British Museum copy reproduced on 2/5 scale by Professor Chapman. We have also, bought in 1917, a chart with the same geographical outline, but re-engraved, and the isogonic lines reduced by William Mountaine and James Dodson, Fellows of the Royal Society, from observations of epoch about 1756, and dedicated to the Lords Commissioners of the Admiralty. We have then three states of each of the two magnetic charts made by Halley from his voyages of 1698 to 1700, with an especially fine early impression of the first, nearly all purchased within the last twenty-five years. It may be that they are not quite so rare as Professor Chapman believes, and we may be allowed to recall our set to his memory.

The fourth chart, and the tidal survey of the Channel, have escaped his notice, though the third voyage in the *Paramour* for this purpose, in the summer of 1701, is well described in letters 71 to 81 of the Correspondence, all to Burchell. Halley proposed it in his letter of April 23; in that of June 11, when the ship was ready, he submitted that his instructions should include "Where there are irregular and half Tides to be more than ordinarily curious in observing them. You are likewise to take the true barings of the principall head lands on the English Coast one from another, and to continue the Meridian as often as conveniently may be from side to side of the Channell, in order to lay down both coasts truly against one another." By July 29 he was able to report that he had "ankered all over it, from the Forland to Portland, and from Blackness to the Casketts on the French side: and have been particularly curious in this part between the Isle of Wight and Portland and the French coast against it, where I find the Course of the Tides very extraordinary but which I think I can describe effectually." Letter 82 to Sir Robert Southwell explains the method of the survey, which was finished on October 2.

The first chart of the Channel, engraved by Mount and Page, to show the results of this, Halley's last voyage as a naval officer, may be really rare; so far as we can ascertain there is no copy in the British Museum, and there was none

in the collection of this Society until 1938, when a fine copy in two sheets was found loose in a volume of Greenville Collins' Coasting Pilot of 1693, bought for the Society from Maggs. It gives depths in fathoms, and in Roman numerals the Hour of the end of the stream that sets to the eastward on the days of new and full moon, with the rule for finding the hour for any other day, by adding the hour of the Moon's meridian passage on that day. One would like to see Halley's results compared with present data.

A larger version of this chart, also by Mount and Page and with no date, came to us loose in a later edition (1753) of Greenville Collins, presented by Mr. H. C. Andrews in 1934. The outline is similar but more detailed; the latitudes along the south coast 5′ less; the hours for the ending of the tidal stream are occasionally a little different at the same stations, and there are no more. The date of this chart may be deduced from the statement that the Variation is "now" 15¼°, which at the given rate of change, a degree in five and a half years, makes the date 1744. The soundings are much the same where we have examined them, a few additional, a few differences which look like mistakes of the second engraver. There is what we take, from a telephone comparison, to be an earlier edition of this large chart in the British Museum. On our chart of *c.* 1744 there is a curious long note to explain why, on the quoted authority of Halley, the Lizard has been laid down in 49° 50′ N., whereas in fact it is shown on this chart in 49° 57½′; the present Admiralty Chart makes it exactly the same.

Professor Chapman's paper with its excellent reproductions is something much more substantial than an Occasional Note, and it is well to find it reprinted and put on sale as a separate pamphlet by the Royal Astronomical Society. To the author and to the publisher all physical geographers will be grateful, for opening up several pleasant lines of further inquiry. A. R. H.

REVIEWS

AFRICA

LAND, LABOUR, AND DIET IN NORTHERN RHODESIA: an economic study of the Bemba tribe. By AUDREY I. RICHARDS. Published for Intern. Inst. of African Languages and Cultures by the Oxford Univ. Press, 1939. 8½×5½ *inches;* xvi+424 *pages; illustrations and maps.* 30*s*

This is a very thorough economic study of the Bemba Tribe, published for the International Institute of African Languages and Cultures. The Bemba people inhabit a section of N.E. Rhodesia and are still at a primitive stage of culture. The author, a trained social anthropologist, spent a considerable period of time working in the field and took the trouble to master enough of the Bemba language to get at the heart of many native customs and problems. It is certain that no one ever does make much progress in studying an African tribe unless he can converse with the people. By being able to make a joke in their language, by sympathizing in their sorrows or rejoicing in their joys, in words they use themselves, one can win the confidence of a primitive tribe. This Dr. Richards obviously did and benefited enormously by being able to check accounts given her by old and young, men, women, and children, of their way of living and their intense preoccupation with food; in their case, primarily millet. Dr. Richards begins by giving a short account of the Bemba people, their country,

and their diet. In the second part of her book, she describes in great detail the native ideas on food and drink, especially millet and beer; the customs associated with food; and its place in the daily routine of men and of women.

In Part III she deals with diet and domestic economics, kinship groupings, the woman's duties in regard to food; the rules of hospitality; village distribution; and the general ideas of the Bemba people on ownership, sharing, wealth, and money. In Part IV she describes in full detail all the processes involved in the production of food, including land tenure, soil selection, methods of cultivation, and minor forms of food production such as hunting and fishing. Finally a short section is devoted to religion, magic, labour, and time, mainly dependent upon food production again. The book is well documented, authoritative and interesting. The only criticism that might be made is that it is rather too diffuse. It is adequately illustrated. A. B.

THE BANTU TRIBES OF SOUTH AFRICA; photographic studies by A. M. DUGGAN-CRONIN. Vol. III, The Nguni. Section IV: The Swazi, with an introduction by HILDA BEEMER. *Cambridge: Deighton, Bell and Co.*, 1941. $11\frac{1}{2} \times 8\frac{1}{2}$ *inches;* 32 *pages and* 32 *plates.* 25*s*

This publication gives thirty-two fine photographs of the Swazi, illustrating the types of men and women in their various grades, trades, and styles of clothing as well as their houses, the country in which they live, and their industries. The essential similarity of the structural mould of the negro features is well exemplified, since similar types can be seen in almost every tribe, not only among the Bantu proper but also among the pure negroes of the West, stretching right up to the Gambia.

An introduction by Hilda Beemer gives a short conspectus of Swazi history and culture, and more particularly of their social organization, economy, and tribal customs. The Swazi are composed of many scattered peoples which some two hundred years ago were amalgamated under the Nkosi Dlamini of Embo Nguni origin, but they still retain many of their varying and original styles of dress, house-construction, and methods of preparing food. More than a third of them live in the Union.

There are over fifty clans, divided into grades, but their origin, organization, and connections are for the most part obscure. The chief political and executive authority rests with the king, who is the lineal descendant of the first leader of the Nkosi Dlamini, but much of the power resides in the person of the queen-mother, who is preferably the daughter of a foreign ruler or of a powerful local chief; she is the guardian of the most treasured ritual objects and has her own court and councillors. It is her village which is regarded as the capital of the country, and it is she who, with the help of the brother of the deceased monarch, rules as regent during the minority of a young king. The ruler is bound to consult the two councils, the Liqoqo, composed of some twenty men selected by merit, and the Libanda Laka Ngwane, the assembly of the whole of the adult responsible men, whose spokesman is usually a prince appointed by the Liqoqo and whose opinion, publicly voiced, cannot well be ignored.

The position of women is higher than among most Nguni but they possess greater prestige in the home of their parents than in that of their husbands, where they are bound by many restrictions and the jealousy of the other wives; they attain their greatest development and power in that of their sons. On the whole, the economics and social structure differ little from those of their neighbours or those of the average negro; this is also the case with their religion, in which ancestor-worship bulks most, and the cults of magic and divination.

The history of the Swazi has been unfortunate, a fact chiefly due to the impact of concession-hunting Europeans, who still own some two-thirds of their land, a position naturally not acceptable to the tribe. P. A. T.

LAND TENURE IN AN IBO VILLAGE IN SOUTH-EASTERN Nigeria. By M. M. GREEN. (Monographs in social anthropology, No. 6.) *London: London School of Economics*, 1941. 9×7 *inches;* vii+44 *pages; sketch-maps.* 4*s*

In this short monograph the author details the results of investigations into the land tenure of an Ibo village in south-eastern Nigeria. She spent there two periods of six months; only in the latter did she touch openly on the question, realizing from the start the extreme delicacy with which such a matter must be discussed in this region. Throughout negro Africa the ownership and the use made of the land affords the most vital of all problems, as its wide ramifications trench upon religion, ancestor-worship, and tabus which are of far more importance than the actual method of farming employed and the amount of crops produced. Ale, the Earth Goddess, is far the dearest member of the Ibo pantheon.

Probably no other people holds the land in such value as the Ibo and the particular village here studied appears to be a fair sample of the thousands occupied by this people, the largest and one of the most attractive negro tribes in the world. The village of Umueke-Agbaja is inhabited, according to tradition, by the descendants of a common ancestor and is an exogamous unit insomuch as intermarriage is forbidden in the community and also with a neighbouring hamlet, which is regarded as nearly related. It is also divided into two sections, which claim to be descended from the two wives of the original ancestor. The population is not so dense as in some parts of the Ibo country and is reckoned at some four hundred and fifty to the square mile. The land, though in parts fertile, is on the whole rather poor and therefore, according to the wasteful method of farming employed throughout so much of Africa, has to lie fallow for considerably more than the three or four years usual in more favoured localities, sometimes indeed for more than a dozen years. As a result a considerable proportion of the inhabitants are forced to "borrow" land from a neighbouring community, which fortunately has it to spare.

In this village there appears to be no strictly communal land; all of it is owned by the various extended families. On the other hand, individual ownership is modified in certain respects, the principal one being that, as usual, no land can be sold, though it can be pledged or leased. In the words of one of the author's informants "Land cannot be lost." Though the members of a group possessed certain communal rights over the land, individual proprietorship is so developed that even a man, his wife, and his children will each work separate portions and their yams will often be stored in different Obba, or racks. At the beginning of the farming season the members of each kindred group consult as to the area which they will severally farm, but generally each family keeps to its own region. The brothers usually take the advice of the eldest and a father allots a share to each of his sons. To a certain extent the land is inherited, the eldest son having the first claim, but when the question arises of dividing out the land of a group it is discussed by the entire village and the elders apportion the various areas.

Changes are being gradually introduced: for instance, in the old days palm-nuts could be cut by everybody, but now the right is becoming restricted to the owners of the particular farm. Fortunately here no question of urban population has arisen and there will be time to balance the social and economic advantages of the outright sale of land.

The monograph is to be welcomed as a careful and sensible account of the land question in this area and it is only by the synthesis of many such investigations that sufficient information can be gathered for the proper determination of the best treatment of this, the most important of all African problems. P. A. T.

NORTH AMERICA

ALASKA CHALLENGE. By RUTH and BILL ALBEE. *London: Robert Hale*, 1941. 8½×5½ *inches;* vii+345 *pages; illustrations and sketch-map.* 15*s*

The authors of 'Alaska Challenge,' after investing all their slender capital in stores, set off to cross British Columbia and reach Alaska. Leaving Prince George they trekked to Fort McLeod, Fort Grahame, and Whitewater Post. From Whitewater Post they made over the Sifton Pass to Liard Post: it is this part of their journey which was the most difficult and also the most interesting, for although trappers may have travelled over the region the country has not been surveyed and the only map showing any detail was completely false. The hardships they suffered in this part were very great owing to lack of food and getting hopelessly lost. That they managed to get through the country is a very real tribute to their spirit and endurance; for those who like reading of this kind of adventure there is much to admire in the book, others will perhaps regret that a journey into unsurveyed country should have been made by those who were so little equipped to bring back scientific results.

The last section of the book is a pleasant account of life amongst the Eskimo at Nome and Cape Prince of Wales. At Wales they spent a year, teaching in the settlement school and bringing up a family. Much of the book is very naïve, the style as a whole is discursive and personal but lively. Although both Ruth and Bill Albee are named as the authors, the book appears to have been written entirely by the latter. D. R. C.

A NATURALIST IN CANADA. By DAN MCCOWAN. *Toronto: Macmillan*, 1941. 8¾×5½ *inches;* xii+284 *pages; illustrations.* 15*s*

This volume consists of a number of short essays based on broadcasts given over the Canadian radio. It covers a variety of subjects of Canadian natural history in its widest sense, from Ontario bears and Canadian cows to glaciers and Trilobites. It is written in a popular style suitable to the audience to which it is addressed and with a certain sly humour characteristic of the Scottish origin of the writer, who emigrated to Canada from his home in Perthshire when still a youth, and settled in Banff in the Rocky mountains.

A chapter on the Pronghorn, that remarkable survivor of an otherwise extinct family of antelope-like animals, relates their former abundance on the western plains, and their almost complete destruction by the surge of western settlement in the early part of the present century. Happily they seem to have adapted themselves to modern conditions and through legal and other methods of protection are now again becoming numerous in Alberta and Saskatchewan. Other chapters deal with the economics of Canadian fungi and its abundance; the value of the Whitefish of the Canadian lakes as a source of food supply, and many other similar topics.

That Mr. McCowan is a skilful photographer is shown by some of his work illustrating the present volume. The reviewer can recommend this book to all who are interested in the natural history of the vast Dominion of Canada.

W. L. S.

CENTRAL AND SOUTH AMERICA

CAPE HORN. By FELIX RIESENBERG. *London: Robert Hale*, 1941. 9½×6 *inches; 488 pages; illustrations and maps.* 18*s*

This book, written in a breezy style by a seaman and descendant of Dutch seamen, records the gallant exploits of many generations of sailors in the region of Cape Horn. It will appeal strongly to all those interested in the sea, though the serious student will find less perhaps to his purpose. The author has evidently studied the historical records with great zeal and industry, but the style is discursive, and the arrangement not very systematic. Ranging from Magellan to the present day, and from buccaneers to scientists like Fitzroy and Darwin, the book reproduces many stirring episodes of tempest, fire, and shipwreck. These are illuminated by the author's personal experiences, which began with a sailing voyage before the mast and included service as navigating officer in the American–Hawaiian line.

A whole chapter devoted to Drake's voyage records, in the words of the somewhat flamboyant notice on the wrapper, a "major geographical discovery," but this claim need not be taken too seriously, though as the author regards it of some importance, it cannot be entirely ignored here. The view pressed, somewhat injudiciously no doubt, by certain writers that Drake actually discovered Cape Horn, is dismissed as a myth, and the author has no difficulty in showing how ill Fletcher's account of the landfall made after Drake's entry into the Pacific fits the character of Horn island. Analysing the courses sailed, largely on the basis of Da Silva's log, and allowing for the Cape Horn current, he places the island or islands of Queen Elizabeth, as the land was named, in about 57° S., 74° W. As no land now exists there, he has recourse to the theory of a sunken land, supposed to be represented by the shoal found by Captain Burnham of the *Pactolus* in 1885. The argument is ingenious but unconvincing: undue weight is given to comparatively late maps which placed a Drake land near the spot in question, and such contemporary evidence as exists, including maps by Hondius, who resided in London at the time and had good means of knowing the story then current, is for the most part ignored. In Drake's own time, Elizabeth Island was assuredly regarded as the southernmost of an archipelago, not a mere speck in the ocean. Drake certainly deserves the credit of having shown that a clear stretch of ocean existed to the south of South America.

Misspellings such as portolanto for portolano and Purchase for Purchas, and a certain lack of discrimination in the choice of material, make it difficult to accept the author as an accurate scholar. His notes however on the various types of ships which made the passage of the Horn through the centuries have a real interest. The book is well illustrated by maps and views. E. H.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

THE SHEPHERD OF BANBURY'S RULES. By J. CLARIDGE; annotated by G. H. T. KIMBLE, with wood engravings by MARGARET WEBB. *Reading: School of Art, The University*, 1941. 9½×5½ *inches; 118 pages*

'The Shepherd of Banbury's Rules' were first published in 1670 under the title of 'The Shepherd's Legacy' by John Claridge, Shepherd. In 1740 an unknown editor republished the 'Rules' substantially in the original form but with considerable commentary, which was re-issued from time to time with little alteration until 1827. Mr. Kimble has reprinted this last edition. On the title-page the work is called 'The Shepherd of Banbury's Rules'; in the title following the

introduction and preceding the 'Rules' it is called 'The Country Calendar or the Shepherd of Banbury's Observations,' and this latter provides the running headings, so that the precise title of the book is a little vague. Mr. Kimble has written an introduction, which is an excellent summary of our present weather knowledge, with an idealized vertical section through the warm sector of a depression, and a second horizontal section to show the relation of rainfall to the isobars, the wind, and the fronts. This introduction is concise and of value, apart altogether from its relation to the Shepherd and his Rules. It is followed by a reprint of the introduction to the edition of 1827, which has not the same merits. Then follow the twenty-six Rules with a commentary on each by the anonymous editor of 1740 or 1827 and a further commentary by Mr. Kimble; and the Rules are illustrated by twenty-eight engravings on wood by Margaret Webb. The book is handsomely printed by the School of Art of the University of Reading. The edition is limited to 120 copies, of which the author has kindly presented one to the Society.

OBITUARY

DR. JOHN BALL

John Ball was born in Derby in 1872 and at the early age of fourteen was apprenticed at the Phoenix Foundry in that town. He soon became a skilled draughtsman and was employed on the drawings for Battersea Bridge, the Liverpool Overhead Railway, and other large projects of his firm. Having gained a National Scholarship, he entered the School of Mines, carried off most of the prizes, and was awarded the first Whitworth Scholarship of his year, which enabled him to complete his technical education at the School of Mines in Freiberg, and at the University of Zürich, where he took his Doctor's degree. On his vacations he worked in lead mines in the Isle of Man and at other mines in Germany and in Spain. With these varied technical qualifications he was in 1897 recommended for employment in the recently formed Geological Survey of Egypt, directed by Captain H. G. Lyons, R.E.

In Egypt his work at first lay in studying and so far as possible mapping the geology of the desert near the Nile Valley. His previous training had not only made of him an excellent draughtsman, but his mechanical experience enabled him to get the best possible results from his instruments. His ideals of work reached a high standard, and this made him at times a little impatient with his colleagues and assistants. His deafness also handicapped him and this, together with a preference for reliance on his own exertions, made him prefer more and more to work single-handed, with excellent results.

Financial stringency from time to time necessitated restrictions in the field programme of the geological staff, and during one of these Ball's activity was transferred to Aswan in order to make a careful geological survey of the first cataract where engineering work on the Aswan Dam had already been begun. His past experience in engineering and his efficiency as a surveyor facilitated ready cooperation between him and the engineering staff of the Dam, and they quickly recognized his ability.

From October 1895 to April 1896 his chief had been employed by the Ministry of Public Works to clear the Island of Philae and the ancient buildings on it from the debris of the later Coptic villages which overlay them; and also to ascertain what parts of the great temples were solidly founded upon rock and what rested only on river alluvium which had been deposited on the rock floor. This information having been obtained, the engineering staff at the Dam site undertook the execution of the necessary underpinning of some portions of the buildings. A specialist in such work had already come out from England and very wisely Dr. Ball was associated with him in planning what should be done and in the execution of what was needed. The result is that the temples of Philae to-day have been placed in as secure a condition as is possible for them to be, as has been proved by the Nile floods of the past thirty years.

Among John Ball's most important contributions to the science of topographical surveying were his advocacy of the use of the slide rule, which he reckoned third in importance to the theodolite and the plane-table, his method of fixing points of detail by triangulation from the ends of a short base (see pp. 53–9 'West Central Sinai'), and in 1911 his new method of coastal survey by depression angles, since employed with excellent effect by the Danish Geodetic Survey in Greenland. When in the field his energy was unbounded. In good weather he worked from sunrise until dark, and on returning to camp did not rest until hours of computation had satisfied him that there was nothing wrong with the day's measures.

A relentless critic of his own and other people's work, he had an uncanny knack of laying a finger on the weak spot of an argument, method, or instrument. Although he insisted that his subordinates should rigorously follow the methods which years of experience had taught him to be the best, he was always on the look-out to study and test anything new. His 'Handbook of the prismatic astrolabe,' written in collaboration with H. Knox-Shaw, became a standard text-book, and his early trials of the optical theodolite led to several improvements in the design. His most enduring monument is not so much his own large amount of valuable work as the lessons of scientific accuracy and sense of proportion and balance which he drilled into the heads of his followers. His most cherished maxim was "never miss an opportunity of making a check."

In 1914–18 the unrest of the Senussi and other elements led to the military car patrols, some of which he accompanied, ranging far beyond the oases and penetrating the great sand dunes. These patrols, about which comparatively little has been written, were hazardous undertakings in unknown country. They laid the foundations of the technique by which the Libyan Desert has subsequently been explored.

The next few years saw Ball involved in work for the British Government in Somaliland, Arabia, and 'Iraq, but his interest in the deserts west of the Nile was undiminished. He accompanied Prince Kemal ed Din on a series of expeditions west of the Nile, culminating in the traverse of the desert by car to 'Uweinat, which had recently been located by Hassanein on his journey through Kufra to Darfur.

In 1927 he published in the *Journal* his great paper "Problems of the Libyan desert," embodying the experience of some twenty-five years' travel and observation. The enigma of Pottery Hill, with its dump of vessels, far out in the desert, caught the imagination of the most prosaic reader: so did the quest for the undiscovered oasis of Zerzura. But to the surveyor, geologist, and engineer, Ball's views on the underground supplies of water were of major

importance. Many of the facts had long been known, development in Kharga and Dakhla had elicited them; but his static water contours gave a measure at any place of the thickness of dry rock above the potential water resources. Trial wells sunk often under great difficulties showed that in the main the theory was sound, and simple figures also showed that the water of some of the oases could hardly have penetrated from the Nile, but that its source lay in the far-off hills of northern French Equatorial Africa. This same paper dealt with the origin and movements of the great sand dunes, envisaging their steady southerly progress over a period of some 20,000 years; and it gave a first brief account of the Qattara Depression, then recently discovered. Its investigation soon engaged the whole personnel of Desert Surveys, and much of the Geological Survey of Egypt. The lowest point of the floor of the depression lies 134 metres below sea-level and the contour −50 m. is only 70 km. from the Mediterranean. In the *Journal* for October 1933 Ball published a masterly study of the possibility that it might be utilized for power production, sea water to be led in by tunnel to drive the turbines and then to be evaporated within the depression. After long calculation it seemed that the scheme was feasible; but the estimated costs were high, the distance from the proposed generating plants and the Delta (where the power might be used) was considerable, and for the time being it was economical to burn coal or oil at Alexandria. So the scheme was shelved, but with dwindling fuel resources may yet some day be practicable.

Ball's last publication was his book 'Contributions to the geography of Egypt,' published at Cairo in 1939 and reviewed in the *Journal* for September 1940. It is chiefly concerned with the geological history of the Nile and the matter carried in solution and in suspension by the river. He believed that a great lake, of which the Sudd might be regarded as a shrunken remnant, had been tapped by the Nile at the Shabluka gorge, north of Khartoum. On the available evidence the hypothesis seems to many to be not proven. In discussing the much-debated Faiyum depression, he entered the fray with the advantage of a prolonged and intensive investigation by the Geological Survey. His solution is well documented, but unanimity on the problems of the Faiyum is at present improbable. But his comprehensive study of the load carried by the Nile flood is of great value on general and technical grounds, clear and readily appreciated.

The Geological Survey, to which Ball was appointed in 1897, had soon after been merged in the larger Survey Department, and when a special section of that Department for desert surveys was created in 1919, Ball was made its Director. In 1932 he retired from administrative work and was appointed Technical Counsellor to the Survey Department. He had received our Society's Victoria Medal in 1926 for his desert surveys and memoirs on the geography of Egypt. He had been continuously at work in failing health since the outbreak of war in 1939 and died at Port Said on 10 July 1941 at the age of sixty-nine.

For the substance of the above we are indebted to his schoolfellow Mr. James N. Birch; to his first chief in Egypt, Colonel Sir Henry Lyons; to his colleagues in the Survey, Mr. G. W. Murray and Mr. F. S. Richards; and to Dr. Kenneth Sandford.

MEETINGS AND ELECTIONS: SESSION 1941–42

The following were elected Fellows of the Society on 10 October 1941:

W. L. G. Bennett; Harry Boscow; Captain W. F. Maitland Edwards, M.Inst.B.E., F.I.M.E.; R. H. Foxley; Lieut. V. H. Gray; John T. Hillary; Major R. E. Moberly, R.A.S.C.; Voislav J. Vuchkovich; the Rev. Edward Whitford-Roberts

First Meeting, 3 November 1941. The President in the Chair

Elections: P. Austin, B.SC., F.R.S.A.; R. O. E. Boast; E. J. Buhler; Lady Cohen; A. N. Gaunt; S. R. Gothivrekar, M.A.; A. Grove, F.I.C.S.; K. S. Gupta, M.A.; W. Lloyd Harrison; Captain C. A. S. Mansbridge; E. Morris, F.R.HIST.S.; Lieut. T. F. O'Brien; Rev. N. A. Peel, A.K.C.; L. J. Rubin, B.SC.; Rev. G. Seaver

Paper: Reconstruction and development in Eastern Poland 1930–39. By Sir John Russell, F.R.S.

Second Meeting, 10 November 1941. The President in the Chair

Paper: Recent changes in the Spitsbergen glaciers. By Lieut. A. R. Glen, R.N.V.R.

Third Meeting, 17 November 1941. The President in the Chair

Elections: M. J. M. Anderson, M.C.; Major S. T. Apcar; Mrs. Apcar; Major E. A. Lever, B.SC., B.COM.; J. A. McIver, B.SC.; Lieut. P. H. Pinckney; Wilfred Smith; Ejnar Sverdrup; J. Lindsay Taylor

Paper: The Border Mountains and Torricelli Range of Northern New Guinea. By Miss L. E. Cheesman

Fourth Meeting, 24 November 1941. The President in the Chair

Spitsbergen in 1941: Geographical Film (by permission of the War Office) described by Brigadier Potts, Canadian Forces

Fifth Meeting, 1 December 1941. The President in the Chair

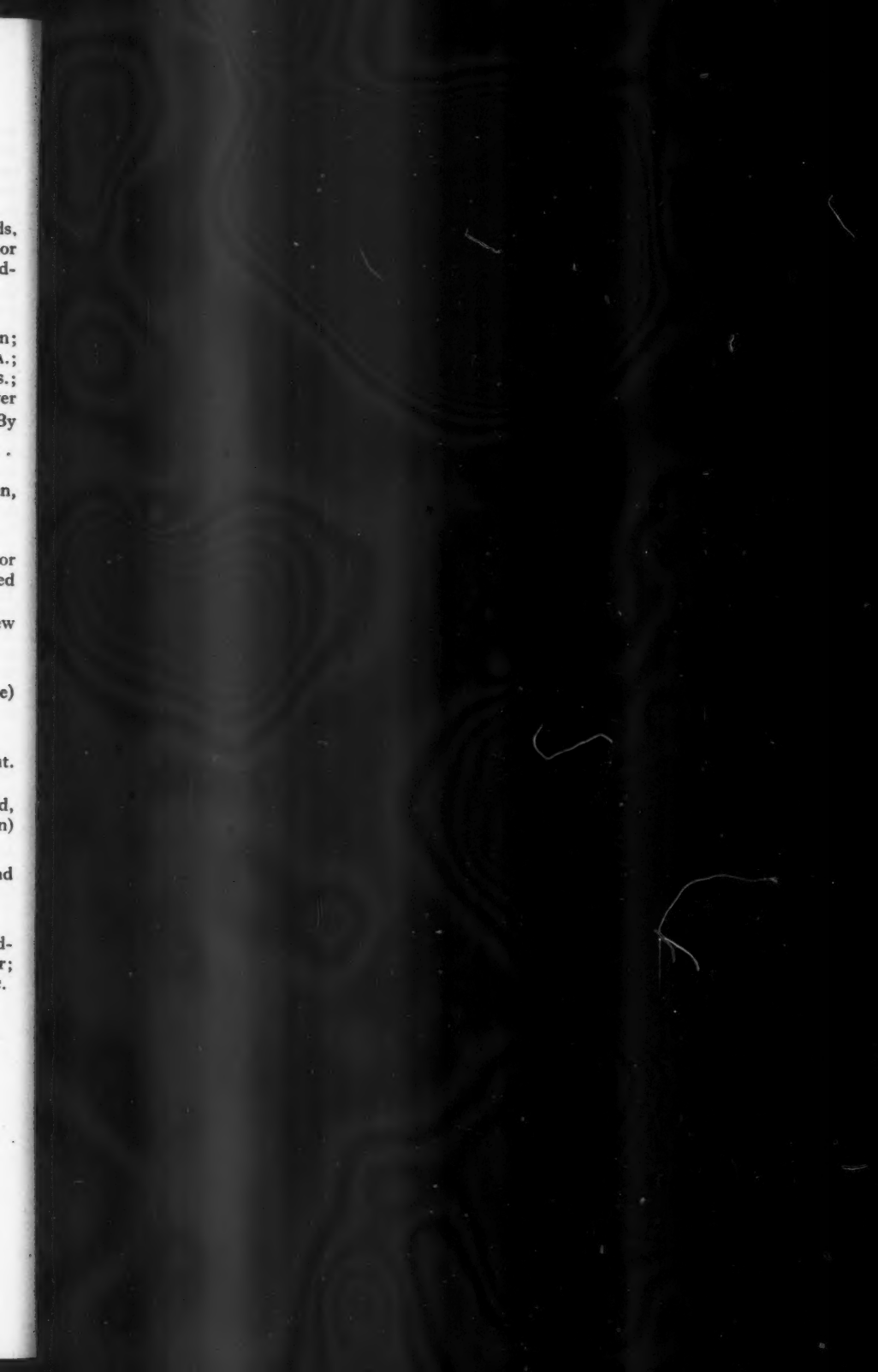
Elections: Donald G. Brown; Lieut. W. H. Goodwright, B.SC.; 2/Lieut. N. J. Llewellyn; P. P. Metge; R. R. Racey; Captain H. G. Richards, R.E.

Paper: Through Western Tibet in 1939. By Captain Robert Hamond, Royal Norfolk Regiment (read in his absence by Lieut.-Colonel Kenneth Mason)

Sixth Meeting, 8 December 1941. The President in the Chair

Paper: Photographic survey by high obliques: the Canadian Plotter and Crone's graphical solution. By Lieut. L. G. Trorey, R.C.E.

Seventh Meeting, 15 December 1941. The President in the Chair

Elections: A. Agar; Miss J. E. M. Campbell, B.A.; Miss H. F. Pickard-Cambridge, B.A.; C. Powell-Cotton; Miss P. B. Davies; G. M. S. Leader; A. Long, B.A.; 2/Lieut. A. B. Mountjoy; Major Paul Pleiss; T. G. Rees, B.SC.

Paper: Syria and the Lebanon. By Mr. J. W. Crowfoot